VERIFICATION AND EXTENSION

OF

LA CAILLE'S ARC OF MERIDIAN

AT

THE CAPE OF GOOD HOPE;

BY

SIR THOMAS MACLEAR,

ASTRONOMER ROYAL AT THE CAPE OF GOOD HOPE.

IN TWO VOLUMES.

VOL. I.

CONTAINING

Identification of La Caille's Stations, and Comparison of the Ancient and Modern Measures.
Description of the Modern Geodetic and Astronomical Instruments.
Geodetic Operations for the Extension of the Arc.
Abstract of the Astronomical Operations.

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VERIFICATION AND EXTENSION OF LA CAILLE'S ARC OF MERIDIAN AT THE CAPE OF GOOD HOPE.

INSTRUCTIONS TO THE BINDER.

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Advertisement by the Editor,
Index to Volume I.

After this, the sheets of the first stitched book, Signatures B to I (its Title Page to be cancelled): and the sheets of the second stitched book, Signatures K to G G (its Title Page to be cancelled): and the unbound sheets, Signatures A to Z, 2 A to 2 P, A to Z, A 1 to 1 Z, 2 A to 2 F.

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VERIFICATION AND EXTENSION OF LA CAILLE'S ARC OF MERIDIAN AT THE CAPE OF GOOD HOPE.

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VOL. I.

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468	4th line from bottom	306°·54′·32″	306°·54″·39′
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OPERATIONS

FOR

THE VERIFICATION AND EXTENSION

OF

THE ABBÉ DE LA CAILLE'S ARC OF MERIDIAN,

AT

THE CAPE OF GOOD HOPE.

PART I.

ON THE POSITION OF LA CAILLE'S STATIONS.

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§ 1. Introduction.

The astronomical celebrity of the Abbé De la Caille's visit to the Cape of Good Hope, in the last century, together with the remarkable result from his arc of the meridian, naturally prompted me to take an early opportunity of becoming acquainted with his principal stations, and to connect the southern, which was his Observatory in Cape Town, with the present Observatory. I soon found that the lapse of eighty-five years had obliterated all local evidence of the French astronomer's operations; and the fact that he had been here at all, was mainly kept alive by the inquiries of Captain Everest in the year 1820. I except from this apathy a few scientific gentlemen, whose connexion with the colony is of comparatively recent date.

Having read with attention the papers published by him in the *Mém. de l'Académ. des Sciences,* and having carefully perused his printed journal, I

applied to His Excellency, Sir BENJAMIN D'URBAN, for leave to inspect the official records between 1750 and 1753, which was obligingly granted; and, although I did not succeed in procuring a copy of the order of Governor TULBAGH for building the Observatory, under the superintendence of M. DE RUYTER, which I had hoped would allude to the spot where it stood, nor the order to M. MÜLLER, to assist him in the measurement of the base line; still several letters and notices were brought to light interesting to the astronomer, particularly the recommendatory letter of the Prince of ORANGE to the Governor of the Cape, signed by his serene highness, the official correspondence, the memorial of the Academy of Sciences of France to the Dutch ambassador, and the report of the States-General on the occasion.

It now became necessary to pursue an indirect course—to trace the residences and property of all persons of the name of BESTBIER, the name of the person in whose house the Abbé states he resided, and on whose premises the Observatory was built. I ascertained from the records in the Transfer Office, that only one person of the name of BESTBIER held property in Cape Town in the year 1751; and he answers to the description given by LA CAILLE. By tracing down the successive transfers of this property to the present time, I was led to the house in Strand Street, now occupied by Mrs. DE WITT, which is the house referred to by Captain EVEREST. This lady permitted me to inspect her title-deeds and diagram: they exactly agree with the records in the Transfer Office. I may further mention, that the position and form of the premises correspond with several remarks made by LA CAILLE in his operations, which will be particularly alluded to in the sequel.

In the meantime, my predecessor, Mr. HENDERSON, desirous to assist the investigation, presented the Observatory library with a copy of WALES and BAILEY'S *Astronomical Observations*, wherein there is a description of a triangulation by Mr. WALES, for joining the spot where he observed with LA CAILLE'S position. But Mr. WALES omitted to register his own position; and all the inquiries made, occupying several days, led to no conclusion. His triangles, he states, correspond with the form of the intervening streets. By adapting them to Grave Street, across the Parade, the last angle (being obtuse) leads to Mrs. DE WITT'S front door, and not to the Observatory, which was at the bottom of the yard behind, as will be seen presently. This

fixes Mr. WALES's position, (which, he says, is the same with MASON and DIXON's,) in Concordia Gardens,* a noted club-house sixty years back.

Captain COOK lodged at the house of a Mr. BRANDT, whose daughter-in-law I have seen. She shewed me a copy of COOK's *Voyages*, presented to her father "by the Lords Commissioners of the Admiralty, for his attention to Captain COOK and other English sojourners at the Cape." Her father's residence was in the Heerengraght, nearly opposite to a noted house in the present day — George's Hotel. Mr. SLOMAN, a linendraper, now occupies the house, and a north-east triangulation from it would lead to the anchorage in Table Bay. I particularise names, because, where there is no remarkably well-described monument of a residence in a town liable to changes in the buildings, it can only be traced by a reference to the Registry Office, where names are the principal elements.

Having undeniable proof of the identity of BESTBIER's house with that now occupied by Mrs. DE WITT, the search for the position of the Observatory was brought within narrow limits; for LA CAILLE states it was in the court of the house where he lived. I therefore proceeded to connect the house with the Royal Observatory by triangulation, being resolved to spare no pains in the execution, as I entertained a hope that I should thus detect whether Table Mountain affected his plumb-line.

In the meantime, I had communicated my views and proceedings to Captain BEAUFORT, who is ever ready to countenance and support any proposal for the advancement of science; and to Mr. AIRY, the Astronomer Royal, from whom I shortly afterwards received a letter, informing me that he had written to the Secretary of the Admiralty, requesting permission of the Lords Commissioners of the Admiralty to send out BRADLEY's zenith sector, that I might verify at once the amplitude of the arc. This was exactly my wish, provided I could identify the northern station. The first step, therefore, was to ascertain this point. Accordingly, I called upon Mr. HERTZOG, the assistant surveyor-general, who accompanied Captain EVEREST to Klyp Fonteyn in the year 1820. His duties at this time were too pressing to justify his absence; but he was so kind as to lend me the drawings he made in 1820, and to supply a description of the platform of the granary referred to by Captain EVEREST, together with the names and

* See Appendix, No. 1.

residences of persons to whom I should apply for information. Lieut. WILLIAMS, of the Royal Engineers, a zealous officer, and devoted to his profession, volunteered to accompany me. We took the opportunity to visit LA CAILLE's triangulating points on Capoc Berg and Riebeck's Castel, and to traverse the direction of his base line on Zwartland Plain.

So many changes had taken place at Klyp Fonteyn within the last fifty years, that, besides an examination of the buildings and ruins, a close investigation into the history of the proprietors became necessary; for when I saw the old foundation, described as the platform of the granary by Captain EVEREST, and compared its dimensions with LA CAILLE's statement, and remarked its position and distance from the old house, so unlike the arrangements of the Dutch farmers, I had strong reason for doubting its identity with the granary of LA CAILLE. I was about to undertake a responsible and a very important task, and it became my duty to receive nothing for granted that admitted of a question. My doubts were further confirmed on referring to JERRIT COTSEE, who has resided at or near the spot for sixty-eight years, and whose testimony will be described hereafter.

I beg it may be distinctly understood, that I by no means undervalue Captain EVEREST's exertions and discrimination in his own inquiries. But, without charging the inhabitants with a desire to mislead, I may state that a longer residence in this colony has taught me that, in their readiness to afford an affirmative answer on all occasions, they are apt to affect a knowledge of circumstances which they do not possess. Captain EVEREST will readily grant this, and will see its force, when he learns that the aforesaid platform on which he stood was within eighty yards of two foundations, of which there was not a vestige above ground to indicate their existence.

This general outline being premised, I proceed to the description of the two stations, and to the discussion of the evidence upon which they rest. As I before stated, the only records I could obtain of LA CAILLE's visit consist in the official letters that passed between the government authorities on the occasion, and two or three notices, which may be enumerated as follows:—

The first (Appendix, No. 3) is a memorial from the Academy of Sciences, delivered by the Marquis de PUYSIEULX at Versailles, to M. LESTEVENON, the Dutch ambassador. This letter displays in a strong light the jealousy of the Dutch authorities with reference to the Cape colony. "Il n'a besoin

d'aucun domestique, d'aucun aide, il restera en pension dans le lieu que l'on lui indiquera. . . . . Les Hollandois, qui ont accordé à M. Krosick la permission d'entretenir au Cap un astronome Prussien, destiné à exécuter précisément le même projet dont il s'agit, ne peuvent raisonnablement la refuser au roi pour un astronome de son académie, qui se tiendra exactement dans le lieu qu'on lui assignera, soit dans le fort, soit dans l'intérieur des terres!" The Abbé, however, was not confined to one spot: he was hospitably entertained and respected, as he acknowledges on several occasions.

The second (Appendix, No. 4) is an extract from the journal of the States-General, noticing the receipt of Mr. Lestevenon's letter, in which the Marquis de Puysieulx's Memorial is communicated, and referring it to the consideration of the Representatives of the States-General and the Directors of the Dutch East India Company at Amsterdam.

The third (Appendix, No. 5) is an extract from the same journal, noticing the receipt of an answer from the Representatives and Directors at Amsterdam, and granting permission to M. de La Caille to proceed to the Cape.

The fourth and fifth (Appendix, Nos. 6 and 7) are from the Representatives and Directors at Amsterdam to the Councillor Extraordinary and expected Governor at the Cape of Good Hope, inclosing the resolutions of the States-General.

The sixth (Appendix, No. 8) is a letter from his Serene Highness the Prince of Orange, addressed to Governor Tulbagh, introducing and recommending La Caille to his Excellency.

The seventh (Appendix, No. 9) is the Governor's reply.

The eighth (Appendix, No. 10) is an extract from the journal then kept by the Secretary to the government at the Cape of Good Hope, dated 19th April, 1751, announcing La Caille's arrival, his objects, &c.

The ninth (Appendix, No. 11) appears to be the official envelope covering private letters to La Caille.

The tenth (Appendix, No. 12) is at this time particularly interesting: it is an application from M. Müller, the engineer of the fortress, to Governor Tulbagh, for an extension of leave of absence for the reasons therein stated. La Caille says (*Mém. de l'Académie,* 1751, page 425): "M. Tulbagh, gouverneur de la colonie, ayant approuvé le projet que je lui présentai sur ce sujet, et ayant nommé M. Muller, capitaine d'artillerie et ingénieur de la

forteresse, pour être témoin de mes opérations," &c. Again (*Journal*, page 185): "M. MULLER, capitaine d'artillerie, arrivé à Drie-Fonteyn le 5 pour assister à mes observations, vint me rendre visite sur Riebek-Castel, et s'en rétourna un peu après." LA CAILLE was detained eleven days and nights on Riebeck's Castel by bad weather, waiting an opportunity to observe the signals on Capoc Berg and Klyp Fonteyn, which explains the delay, the cause of MÜLLER's letter.

The eleventh (Appendix, No. 13) is an extract from the journal of the Secretary, stating the heights of the neighbouring mountains.

The twelfth (Appendix, No. 14) is an extract from the journal of the Secretary, registering LA CAILLE's departure from the Cape.

Authenticated translations of these letters and notices are annexed.* I have seen the originals. I expected to find Count BENTINCK's letter to the governor; also LA CAILLE's survey of Hout's Bay, made at the request of the governor; and the order for building the Observatory: but neither these, nor the memorial on the arc, are registered in the journals.

§ 2. IDENTIFICATION OF LA CAILLE'S STATION IN CAPE TOWN.

The Abbé arrived at the Cape on the 19th of April, 1751. He says (*Mém. de l'Académie*, 1751, page 522): "J'allai le lendemain me présenter à M. TULBAGH, gouverneur du Cap, muni d'une lettre du feu Prince d'ORANGE; elle fut suivie d'autres lettres de la Compagnie de Hollande et de M. le Comte de BENTINK. M. TULBAGH me reçut avec beaucoup de politesse; je fus accueilli de même très-gracieusement par tous les principaux officiers de cette colonie. Un des premiers bourgeois de la ville, nommé M. BESTBIER, Allemand de naissance, et qui a servi autrefois dans les troupes de France, m'offrit obligeamment sa maison, et la disposition absolue de tout ce qu'il avoit chez lui. On verra, dans la suite de ce discours, qu'il ne tint pas à lui que toutes les observations que j'ai entrepris de faire pendant mon séjour au Cap, n'eussent tout le succès possible. . . . . . M. le gouverneur apprit que je me disposois à faire bâtir un logement exprès pour y placer mes instrumens; il donna aussitôt ses ordres pour que les ouvriers que la Compagnie de Hollande entrétient à ses gages y travaillassent incessamment,

* See the Appendix.

suivant le plan que j'en donnerois, et que les matériaux fussent tirés des magasins de la colonie. J'employai tout le mois de Mai à faire construire cet observatoire, où rien ne fut épargné de tout ce qui pouvoit contribuer à lui procurer toutes les commodités nécessaires, et ce qui est le plus important dans l'astronomie pratique, toute la solidité possible aux piédestaux sur lesquels mes grands instrumens devoient être placés." Again (page 526): "Je trouvois toutes sortes de facilités, et dans la complaisance de M. Bestbier, mon hôte, qui s'empressoit à me procurer toutes les commodités possibles, réglant même les heures de ses repas sur les momens où je pouvois être libre," &c. Also (page 529): "M. Bestbier, cet hôte si obligeant chez qui je demeurois, me fit sentir," &c. &c.

These extracts prove that La Caille lived in the house of M. Bestbier, and that the latter was one of the principal burgesses of Cape Town; that the Observatory was built by order of Governor Tulbagh, and by government workmen, the materials being supplied from the magazines of the Company; and that the pillars to carry his larger instruments were constructed with all possible solidity.

To prove the position of the Observatory, I extract the following from page 398. "L'observatoire où j'ai placé mes instrumens, étoit un bâtiment fait exprès par ordre de M. Tulbagh, gouverneur de la colonie. Il étoit placé au *fond de la cour de la maison où je demeurois, sur un terrein élevé de 7 à 8 pieds sur le niveau de la mer.*" Thus his Observatory was built at the bottom or further end of the court of the house where he lived, upon the ground, seven or eight feet above the level of the sea.

I make no apology for these copious extracts, as no doubt should remain on the subject they are meant to clear up. There is only one person of the name of Bestbier registered in the Transfer Office in the year 1751, and only two since. The following is an authentic translation of the register in which the name Bestbier first occurs, furnished by Mr. Zastron, chief clerk in the Transfer Office:—

"Daniel Pfiel and Jacob Leeven, commissioned members of the Board of Orphan Masters, as administering to the estate of the Burgeen, Eaad St. Johannes Blanckenberg, cede and transfer certain houses and premises in this Table Valley in Zee Street (now, 1835, Strand Street) in block A, to

"Jan Laurens Bestbier,	31 July, 1737.
Arend de Waal,	17 Jan. 1766.

Petrus Johannes de Witt, 4 June, 1794.
Johannes Henricus De Witt, 7 Feb. 1797."

The widow of the last-named J. H. De Witt, now about seventy years old, still occupies the house, and holds the title-deeds, which she permitted me to inspect. They, with the diagram annexed to them, exactly correspond with the above extract from the office-register, and with the diagram attached to the original grant of the land where the house stands, made by Governor Der Steel in 1701, to Blanckenberg, who built the house and became a bankrupt.

Mr. Alexander Van Breda, of Newlands, now about eighty years old, remembers, when he was a little boy, M. Bestbier living in the same house; and states further, that the two Bestbiers, late of the Cape Flaats, and now residing in Zwartland, are his grandsons.

Mr. Hertzog, the assistant surveyor-general, possesses a map of Cape Town, made in 1751, now of considerable local value. He kindly permitted me to copy it, on the condition that it was only to be employed for the purposes of the present inquiry. I annex this copy* that it may be compared with the plan of Mrs. De Witt's and the adjoining houses, lately made by Lieutenant Williams and myself, from actual measurement. The extract from the Transfer Office refers the house to block ⟨A⟩: the same is marked on the old map.

La Caille attaches a note to an observation on the station of Riebeck's Castel (*Mém.* 1751, p. 429). "Remarque.—Le coin de la rue dite Heerenstraat, au Cap, est à 73 dégrés du sud vers l'est, du coin oriental de l'Observatoire, à la distance de $111\frac{1}{2}$ pieds. Il se distinguoit fort bien, étant d'un blanc de chaux, et projeté sur la mur du grand attelier de la Compagnie, lequel est peint en noir et fort élevé." The great workshop of the company here referred to is "de Ed. Comp. Warf." block ⟨P⟩ on the map of 1751. The naval yard and stores, smiths' and carpenters' shops, were in this block, and only removed as late as 1813, when the station was changed to Simon's Town. The naval commissioner's dwelling, next to the corner house, is now the custom-house, and the corner house is a prison; the street, which is a prolongation of Heerenstraat, alias Heeregraght or Gentleman's Street, assumes the name of "Justice Street."

On placing myself in this street, towards the top, the line of sight to the

* This copy is not here given; but the position of the house may be seen in Plate I.

second peak of Riebeck's Castel is a tangent to the opposite corner of Mrs. DE WITT's block; while the distance, $111\frac{1}{2}$ feet, and the bearing, 73°, carries us into Mrs. DE WITT's yard to the point marked on the plan, as the probable site of the Observatory. This almost accidental remark of LA CAILLE is alone sufficient evidence of the position of his Obervatory. There is one more (page 456), "La mer s'élève très peu au Cap de Bon Espérance. Il y avoit en face de la maison où je demeurois des roches en mer, qui sont presque à fleur d'eau," &c. The rocks here alluded to still exist, and I have lately had an ample opportunity of verifying his remarks upon them. I could produce the observed azimuth of Dassenberg Rock, and the angle between it and the Capoc Berg signal rock; but I hope enough has been brought forward to fix the identity of Mrs. DE WITT's house in 1838 with that of JAN LAURENS BESTBIER in 1751, and to prove that LA CAILLE's Observatory stood in the yard of that house.

The meridian of his Observatory passes to the east of Mrs. DE WITT's house, a couple of degrees to the left of the high projection into the yard constituting her kitchen and pantry stores, and over the east end of Table Mountain; one-third of which, from the top, must have been exposed to his view.*

Mrs. DE WITT's is the second house in Strand Street, counting westward from the Heeregraght, on the side next the Bay. It is of the description of a good London house. The accommodation it affords may be inferred from the circumstance that, in the year 1806, Sir DAVID BAIRD and the present Right Hon. Lord GLENELG, and, in the present year, his Serene Highness Prince FREDERICK OF ORANGE, lodged in it. Such events are a sort of registry in this colony, and for this reason I mention them, as well as for the purpose of shewing the quality of the house.† I inclose a faithful sketch of the front taken from the corner of the Parade, and another of the back premises from the roof of Roggebay Guard-house, both by Mr. C. PIAZZI SMYTH; which, together with the plan, will convey an adequate conception of the spot.‡ I should mention that this guard-house was built about the year 1789. From

* Since writing this paragraph, I have laid down the direction of the meridian on the walls of the house. The meridian of his sector, I believe, passed over the high building. I believe *β Hydri* was his lowest sub-polar star.

† The value of the house and premises is estimated at 5000*l*.

‡ These sketches are not here given; but the plan of the premises may be seen in Plate I.

the north-west wall of the kitchen within the yard projects the pin, or spike, alluded to by Captain EVEREST, flattened at the end, where it is slightly turned downwards.* In the flat portion there is a hole, and underneath, on the wall, is drawn a rectangular quadrilateral, bisected perpendicularly. A pencil of light through the hole, falls on the middle vertical line at apparent noon. Mrs. DE WITT informs me that this meridian line was there in her father's time (AREND DE WAAL), from whom she always understood it was put up by the French astronomer. I have not seen another of the same kind at the Cape. She further informs me that her late husband erected the high building of two stories now covering the west side of the premises from the dwelling-house to the back street (Rogge Bay), for the reception of merchandise, in the year 1816: likewise the low buildings at the bottom of the yard (between which is the back entrance), to let as tenements to poor people. The upper story of the high building is let to sail-makers, and the low buildings† [lower story?] to fishermen. The latter occupy the site of the Observatory.

It appears by LA CAILLE's description‡ that the Observatory was a substantial building: the floor, five feet above the level of the yard, resting on sand, the pillars must have been tolerably free from vibrations. Whether their diagonal position, as described by him, was a matter of choice or not, I do not pretend to say; but I may remark, that such a position would place the Observatory nearly square with the house: and it has occurred to me, that it might have been so placed with the ulterior view of making it subservient to domestic purposes by removing the elevated floor. If so, it may have been in existence when M. DE WITT erected the buildings before mentioned. However, by the arrangement in the corner, the instruments were in less danger of disturbance, more room was obtained, and the clock was advantageously posted for observation. It is very probable the foundation-stones are still below the surface, but it is impossible now to get at them without endangering the walls. The yard and passage are paved at this time with large irregularly shaped stones.

* This pin is in the meridian of the Observatory, and may have supported the threads he suspended for the purpose of keeping the instrument in the meridian, as stated by himself.

† It appears from the plan (Plate I.), and also from the zenith-sector observations, that the high building occupies the site of the Observatory.—G. B. A.

‡ See *Mém. de l'Acad. des Sciences*, for 1751, page 398.

§ 3. Identification of La Caille's Station at Klyp Fonteyn.

The station at Klyp Fonteyn cannot be so readily traced as that in Cape Town. I have already expressed my doubts as to the situation fixed on by Captain Everest, and that they were further confirmed by the testimony of Jerrit Cotsee, to whom I was referred for information by Mr. Hertzog. When I told this man Captain Everest's opinion, and the source from which the Captain derived his information, he replied with some degree of vehemence that it was the foundation of his father's house, and that the granary was to the east of it, close to the foot of the hill. He immediately walked to the supposed site of the granary and searched about, but no remains could be found where he looked for them. He stated as follows:—He is now seventy-six years old; he came with his father at eight years old to reside at Klyp Fonteyn; and the house they lived in was over that foundation. The roof became faulty; his father repaired it: afterwards he built the house over the stream (the present old house), and the other went to ruin.*

La Caille says (*Mém. de l'Acad.* page 426): "Je plaçai dans la grange de cette habitation le secteur de six pieds de rayon." And (*Journal,* page 180): "Le lieu où nous couchions, M. Bestbier, moi, et Poitevin, étoit un emplacement d'une grange, long de six pieds et large de sept, separé de celui où étoit le secteur par une toile, qui faisoit une espèce de cloison; nous y avions posé les deux matelats de mon lit de camp, à côté l'un de l'autre, sur des sacs à demi remplis de paille. Au delà de cet endroit étoit une autre petite place, où couchoient les esclaves."

Captain Everest gives the following (*Mem. Astron. Soc.* Vol. I. p. 261): "In reference to this matter, it may not be amiss to mention that the daughter of the quondam proprietor of Klyp Fonteyn, now an aged lady named Letchie Schalkeveck, is still in existence, and not only gives a narration perfectly agreeing, but has pointed out the very platform on which the granary once stood; and states further that the signal fires were so large and brilliant, that those of Riebeck's Castel were visible from Klyp Fonteyn, a distance of more than forty-five miles, with the naked eye at night. The same lady relates, also, that the Abbé De La Caille observed the stars with

* For the elucidation of this part of the Memoir, see the plan in Plate II. Also the Appendix, No. 15.

his instrument (the sector, I suppose,) in the granary (an aperture having been made in the thatched roof for the purpose) until the day when the fires were lighted; when, having previously sent M. Poitevin, his assistant, to make simultaneous observations at Riebeck's Castel, he placed it, or some other, at some paces in front of the fire: and as this account tallies with what I have before observed in my remark respecting Riebeck's Castel, it leads directly to the extraordinary conclusion, that not only the signals in these operations were ill defined, but that the instrument for measuring the horizontal angles was not placed over the centres of the stations."

Captain Everest acknowledges elsewhere that he had not seen La Caille's papers in the *Mém. de l'Académie,* which explains the conclusion he arrives at in the latter part of this paragraph; for La Caille *did* reduce his angles to the centre, and he gives the bearings and distances from which the reductions were computed at the stations—Cape Town, Capoc Berg, Riebeck's Castel—not for Klyp Fonteyn; for the reason, I presume, that the point at which the angle between Capoc Berg and Riebeck's Castel, at Klyp Fonteyn, was first measured, was over the picket where the fire was afterwards to be made. Poitevin must have been sent to Riebeck's Castel to superintend that signal; for it appears that La Caille measured all the angles himself with the 3½-feet quadrant. This is the only part of Letchie Schalkeveck's statement that seems improbable. We can trace La Caille through the several stages of this work. He left Cape Town on the 11th of September, and arrived at Klyp Fonteyn on the 14th. He observed there with the sector from the 16th to the 25th. October 13th he enters this note in his journal: "Le soir, un peu avant l'heure des feux, Riebek Castel se couvre de nuages; je descendis ce soir de la montagne, après y avoir resté neuf jours et neuf nuits de suite. Comme le tems de la moisson des orges approchoit, j'avois *résolu de remettre à faire les feux à Picquet-Berg* (Klyp Fonteyn) *aprés avoir mesuré la base, pour laquelle opération,*" &c. On the 17th he commenced the measurement of the base, and on the 26th he was on a visit to the governor at Rondebosch. I suspect the Klyp Fonteyn fire was lighted on the 14th or 15th of October, twenty days after the sector observations terminated, La Caille being on Riebeck's Castel at the time.

But, returning to the important investigation, the platform alluded to by Captain Everest consists of a foundation wall, 63 feet long by 24 in breadth. A considerable portion of it on the west side is two feet above

the ground, and it is situated at a distance of 630 feet from the present old house.

1st. If this was the granary inhabited by LA CAILLE, it must have been at the time nearly full of grain or something else, otherwise there could be no necessity for the confined dimensions (6 feet by 7) of the place where he, BESTBIER, and POITEVIN slept.

2d. The Cape harvest takes place in October and November. LA CAILLE arrived at Klyp Fonteyn on the 14th of September, just before harvest, when there is seldom a full granary; therefore, most probably, it was not occupied by grain.

3d. Where was the dwelling-house of the proprietor?

JERRIT COTSEE distinctly states that his father built the present old dwelling fifty years back. He, JERRIT, must then have been twenty-six years old, and living on the spot, which he did not leave for his present residence, only about one mile off, until 1792. This objection is corroborated by the custom of the Dutch farmers, who, as far as I have seen, build their offices close to their dwellings.

I confess L. SCHALKEVECK's account generally is plain enough, and carries with it the stamp of truth; for I have been told by Mr. HERTZOG, that she mentioned LA CAILLE's little dog, "Grisgris," by name. (*Journal*, p. 97.)

The steps which, in the midst of such conflicting testimony, it remained for me to take, were, first to search out the SCHALKEVECK family; for, according to the common course of nature, the old woman was dead; 2dly, To investigate the authenticity of JERRIT COTSEE's statement; and 3dly, To examine the place by turning up the soil. No one of these could be undertaken immediately, but I laid my plans for their execution; and, on returning from Klyp Fonteyn, I lost no opportunity to inquire after the SCHALKEVECKS, but no one recollected the old lady. I again applied to Mr. HERTZOG, and obtained a detailed account of his journey with Captain EVEREST. It appears they travelled together to Klyp Fonteyn, where they separated. Captain EVEREST went off in the direction of Riebeck's Castel in search of L. SCHALKEVECK, in consequence of some information he received; while he (Mr. HERTZOG) went to JERRIT COTSEE, to whom he read the extract just quoted from LA CAILLE's journal, to make him comprehend the kind of building they were in search of. Captain EVEREST brought up LETCHIE SCHALKEVECK's son to point out the site according to directions from

the mother. It appears the old lady lived at a considerable distance, and did not attend herself, but sent her son. It is to be regretted that JERRIT COTSEE was not brought to the place at the same time; and it is here I conceive the misunderstanding originated; for I can shew, by the testimony of JERRIT COTSEE, aged 76—of his sister, Mrs. LAMBRITZ, of Keptyn's Kloof, aged 71—of his sister-in-law, Mrs. DIRK COTSEE, of Klyp Fonteyn, aged 65—of Mrs. LAMBRITZ, of Groene Fonteyn, aged 69—that no person of the name of SCHALKEVECK has resided at or near Klyp Fonteyn within their memories; consequently, the son could not have any local knowledge of the place; and it is very probable his mother told him he would find the ruin to the east of the stream of water on the rise of the hill, and he did find a ruin on the rise of the hill, and referred to it.

I now applied at the Transfer Office for a list of the proprietors of Klyp Fonteyn, from the year 1751 downwards. The first notice of that property in the Transfer Office is dated 1792, when JERRIT COTSEE divided it, and sold the half on the west side of a mountain (which we afterwards named LA CAILLE's Mount) to JACOBUS GIDEON LOW, which includes the farm-houses and the ruins in question, retaining for himself the portion in the basin or valley bounded by the said mountain on the west, and Piquet Berg on the east and north, where he built a house for himself, and where he still resides.

In explanation, why there is no existing earlier notice or record, I am informed that, as the colony and population increased, the Dutch Company, with the view of bringing the land into cultivation, permitted applicants to locate on loan * places, on the condition that the land and tenements should annually revert to the government, provided they were claimed; but they were rarely claimed, except for public purposes. Such lands, in the end, were usually granted on the payment of quit-rent.†

This may have been the case with Klyp Fonteyn; for, although it is a beautiful romantic spot, with the advantage of a considerable stream of water issuing from underneath a rock, about 300 yards above the habitation, it is

* *Loan places*, so called because they were *lent* to the applicants.

† After this paper was sent to England, I discovered a document which I had long been seeking. (See the Appendix, No. 14.) From this it is clear that the father of LETCHIE SCHALKEVECK was not a proprietor of Klyp Fonteyn from 1744 to 1758, although he resided there. This shews that her statement on that point to Captain EVEREST was not correct.

so insulated by a desert of deep sand, that agricultural produce cannot be conveyed to Cape Town at a less expense than is required to raise it. It is therefore probable that the occupier in LA CAILLE's time was poor. He says (*Journal*, page 181), " En général cette habitation, quoique fort petite, nous fournit tout ce dont nous avions besoin. Elle est située dans un coin de la grande plaine de Sable, qui est entre Berg rivière, et le Piquet Berg, et la mer, à l'endroit où la montagne sans nom dont j'ai parlé, s'approche le plus du Piquet Berg."

When preparing for my second journey with BRADLEY's sector, I made arrangements for exploring the place. I applied to his Excellency General NAPIER, and obtained a corporal of sappers and a private from the artillery corps, under my old companion, Lieut. WILLIAMS. I had, besides, a young Dutchman to act as interpreter (and servant), to prevent misconception, and JOSEPH GIBBS, carpenter to the Observatory; a number of pick-axes and spades were also put into the waggon.

On my way up, I called upon SCHALKEVECK, of Orange Fonteyn, near Capoc Berg, and on SCHALKEVECK, of Matjies Fonteyn, near the Berg river. Both families trace up their pedigree to DIRK SCHALKEVECK, of Groene Fonteyn, about fifteen miles south of Klyp Fonteyn, the place where LA CAILLE slept on his way with the sector. (*Journal*, page 179.) They had no knowledge of LETCHIE SCHALKEVECK, nor had they heard of the French astronomer.

At Klyp Fonteyn, I found an old woman residing with her son-in-law, HENDRICK THIARK, the present proprietor; her maiden name was CLARK, and her age 65. She is the widow of DIRK COTSEE, brother of the present JERRIT COTSEE; was married at the age of seventeen, and has known Klyp Fonteyn forty-eight years. On her marriage, she resided with her mother-in-law, Mrs. JACOBUS COTSEE, who died at the age of eighty, and has been dead thirteen years. She often heard her mother-in-law speak of the French astronomer's visit; and says no one of the name of SCHALKEVECK resided at Klyp Fonteyn within her recollection. When made acquainted with my errand, she took me to a spot where there was a ruin in her early years, stated by her mother-in-law to be the ruins of OKER SCHALKEVECK's house. There was nothing to be seen in the shape of a ruin. The sappers and GIBBS were set on, and exposed in a couple of days the foundation

of a building, fifty-four feet by twelve, with three partition walls; also the remains of an oven at the north end, without the wall, where a quantity of ashes were turned out. (See the plan in Plate II.)

In the meantime, I had frequent communication with Jerrit Cotsee, who often visited us. He called my attention to a mound of clay, where an oven had lately been made, but had fallen down. He said there was formerly an old ruin there. The sappers were set to work upon it, and, at the depth of three feet, encountered a wall, which they traced and cleared with great labour in three or four days. This foundation, like the other, is of stone and clay, well put together. It is twenty-two feet by twelve, and generally from two to three feet below the common surface of the ground. I attribute the depth to the sliding down of the soil from above, for the ground over it is much inclined. Portions of chaff or short straw lay deep in the clay; but I place little confidence in this as an indication of a granary, for it may have been carried down by ants or mice. The ground is hard and dry, and of the kind that is used for making bricks. When the measurement for the plan of the farm-houses was finished, and the bearings of these ruins taken, they were again covered over without disturbing the stones, so that they may be easily re-examined.

Jerrit Cotsee could not give any account of this last-mentioned spot; there was no roofed building there within his recollection; neither could he satisfactorily describe the situation of his father's granary, which he formerly said was to the east of the house; and the position he then assigned to it, about seventy yards eastward, would place the signal fire at his father's door; for La Caille says he chose a place thirty-six toises due west of the granary. Jerrit furnished me with the following list of the proprietors of the farm:—

1. Hendrick Moal.
2. Cornelius Cotsee, Jerrit's ancestor, a French emigrant.*
3. Oker Van Schalkwyck (I suppose the father of Letchie).
4. Jacobus Cotsee, Jerrit's father.
5. Jasper Cotsee, Jerrit's brother.
6. Jerrit Cotsee, the informant, who divided the property, and sold Klyp Fonteyn to
7. Jacobus Gideon Low.

* See the Appendix, No. 15.

8. Mr. Brant.
9. Mr. Melk.
10. Mr. Lorchspur.
11. Hendrick Thiark, the present proprietor.

With regard to the veracity of this man Jerrit, I cannot, as may be supposed, speak positively; he is a healthy, intelligent, active old man, connected by marriage with the most respectable farmers of the neighbourhood, by whom he is designated "father;" and, by the appearance of his house, garden, and farm, I should say he is an age in advance of those about him. Lieut. Williams rode down to Groene Fonteyn in search of local information; on his return he gave the following account:—

"I saw Mrs. Lambritz, now sixty-nine years old, whose maiden name was Fister. She has resided at Groene Fonteyn forty-one years. Her husband bought the place of Munick, who was proprietor for only one year. Munick bought it of Dirk Schalkwyck, who went to reside at Matjies Fonteyn, where he and his wife died. They left one son, named Tunis, since dead; Tunis left two sons and five daughters; one of the daughters married Fister, of Matjies Fonteyn; the two sons reside there also.* She knew no other Schalkwyck. On asking her whether there might not be another of that name about twenty miles from Klyp Fonteyn, she seemed to think not. She recommended me to call on Anne Lambritz, a very old lady, who had long known Klyp Fonteyn; I rode to Keptyn's Kloof and saw her, but she could give no further information. She is sister to Jerrit Cotsee, and is five years younger."

We obtained no other information relating to this family. It is possible she (Letchie) gave Captain Everest her maiden name,† for it is very unlikely

* We have seen them.—T. M.

† I have lately been fortunate enough to trace out the residence of Letchie Schalkeveck. She was never married nor had any children. She had a sister who was married to a person of the name of Watcherhouse (I think), with whom she lived near Riebeck's Castel. After his death, she lived with his son. She died at that place. The son now resides near Saldanha Bay. I am not quite sure of his name.

With regard to the spelling of names in this Colony, I have found the following varieties:—

Kepteyn's Kloof—Captain's Kloof—Kaptayn's Kloof.
Schalkeveck—Schalkewyk—Schalkevyck.
Cotsee—Cotzee—Coetsee.
Rubeck's Castle—Riebeck's Kasteel.
Klip Fontein—Klyp Fonteyn.

that in such a place as Zwartland she could have been entirely forgotten in the space of seventeen years, supposing she died shortly after he saw her. COTSEE understood that OKER SCHALKEVECK's sons went to the eastern province.

It is now clear that there is no one living whose testimony relative to Klyp Fonteyn can be put in competition with JERRIT COTSEE's, and his extends only as far back as 1762, ten years after LA CAILLE was there. We might naturally conclude that much alteration could not have occurred within those ten years, and that his father would have resided in OKER SCHALKEVECK's house, but he denies this to have been the case; then, who built the house he did reside in? to what use was it applied in 1752, if it was then built? for we have the evidence of his mother, through Mrs. DIRK COTSEE, that OKER SCHALKEVECK occupied a house which we discovered according to her directions, exactly under the spot to which she led us.

Mr. HERTZOG's solution of the difficulty explains the whole; and, if he can support it by any satisfactory testimonial, we are pretty certain of LA CAILLE's granary. He believes that OKER SCHALKEVECK and CORNELIUS COTSEE, JERRIT's grandfather, were joint proprietors;* and that JACOBUS COTSEE succeeded to his father CORNELIUS's share at his death, and afterwards purchased SCHALKEVECK's. By this explanation, the platform of Captain EVEREST was old COTSEE's dwelling-house, as JERRIT asserts it to have been: OKER SCHALKEVECK's we know, and the granary was on the foundation which I lately exposed, to the west of the others; and in the same relative position with respect to them as such offices usually occupy in Zwartland, and I believe elsewhere.

The dimensions of this foundation are too circumscribed for a dwelling-house, and its masonry is too good for the purpose of supporting the flimsy hut of a Hottentot, or slave; buildings of the latter kind are besides not oblong, but circular, and are never constructed of more substantial materials than mud, except at the missionary institutions.

I am unable to explain why LA CAILLE was so much confined for room, or to understand his arrangements, if they had any reference to the walls. He says "the place where he, BESTBIER, and POITEVIN, slept, was six feet by seven, separated from the sector by a curtain which formed a sort of

* See the Appendix, wherein this matter is cleared up.

partition: beyond, was a little place for the slaves." (He had eight slaves.) This building is 22 feet by 12 nearly.

Oker Schalkeveck's house and the granary are on the same parallel: the meridional distance between Jacobus Cotsee's house and the granary is 210 feet, rather more than 2″, the granary being to the north of the house. (See the Plan, Plate II.)

There are at this time three families residing on the farm, in a very primitive condition; for two of them occupy buildings put up about 1820, by Mr. Melk, for out-houses. Their names are Hendrick Thiark, Jasper Thiark, and Mr. Castor. The latter is only a renter, and has no property in the soil. A fourth building was burnt in the interval between my visits. They usually cook their food in the open air, behind a screen of brushwood collected for the purpose. Their ovens for baking bread are likewise out in the open air, not very unlike large ant-hills, formed of brick, earth, and stones, and the place altogether exhibits poverty and degeneracy.

On the east side of the stream there are two threshing-floors, or places for treading out corn by means of oxen. The largest of these occupies a large portion of Jacobus Cotsee's ruin. This floor being flat, clean, and firm, afforded a convenient bearing for Bradley's Sector and the Repeating Circle. Behind the floor within the old foundation, and towards its north end, is a small mud-wall inclosure, about five feet high, which they roofed over, in a rough way, at the time I was carrying on the observations, as a receptacle for straw.

Many of the particulars alluded to in this inquiry may appear trifling; they are not, however, without importance in the discussion, and they will, I hope, serve, in conjunction with the map and bearings, to distinguish the ruins now so important from the heaps of rubbish that must ere long cover the place.

§ 4. Identification of La Caille's Stations on Riebeck's Castel and Capoc Berg.

The signals on the triangulating points of Riebeck's Castel and Capoc Berg are easily recognised, and are well described by Captain Everest. I covered over the charcoal remnant of the signal fire on Riebeck's Castel with stones, previously abstracting a portion as an interesting relic. The top of

this rugged mountain offers nothing inviting to visitors; the ascent is laborious and difficult: hence the reason why the signal remained undisturbed, and we were able to enjoy the sight of one undeniable mark of La Caille's work.

These points are admirably suited for triangulation. The Cape district, with Cape Town on one side, Zwartland and Namaqua land on the other, are seen without interruption. The whole of Zwartland plain, excepting the cultivated patches, is covered with brushwood: the soil on the south side of the Berg river is a mixture of pot or brick-clay and sand, tolerably firm, particularly towards Capoc Berg. On the north side of the river sand prevails, and is in general loose and deep.

The base line was measured on the south side; and, although the run is unusually level, I cannot conceive how it could be cleared and measured twice in seven days. If a similar operation should be undertaken hereafter, the base would most probably be measured on the same ground, and, of course, on tressels. In that case, several portions of the line need not be cleared; where the brushwood is short it might be cut down expeditiously with some sharp tool, as a scythe; but where it is dense, and above three feet high, considerable labour would be required. I may safely say there is no place within 300 miles of Cape Town, in the proper direction, so well suited for the purpose.

§ 5. Triangulation for connecting La Caille's Observatory, the Modern Observatory, and Sir John Herschel's large Reflecting Telescope.

I now proceed to describe the operation for connecting the observatories, and afterwards to notice the heights, distances, and bearings of the mountains about Klyp Fonteyn.

Another position is included with the former, one that must ever excite the feelings and enthusiasm of the admirers of genius: I need scarcely name the scene of Sir John Herschel's recent labours. When made acquainted with my intention, he opposed it on the ground that his observations being differential, they were not necessarily connected with one spot more than another; and he only submitted, in the end, to that which he could not easily prevent.

Although the distance between the points to be connected is compara-

tively insignificant, as much care is obviously required in the measurement of the base, and greater attention in placing the signals, than in operations on a large scale. Furthermore, the house in Strand Street is nearly invisible from the Observatory; the front parapet and chimney only emerge above the rising ground half way between the Observatory and Cape Town. The line of sight thus passing close to the ground, the chimney can scarcely be distinguished when the atmosphere is dry, or in strong sunshine.

Sir John Herschel's position is hid from the Observatory by the high ground occupied by the village of Rondebosch. The house is masked by a grove of high trees, and is invisible from any other commodious station. It is situate close to the foot of Wynberg Hill on the north side; and I may here mention, as a ready means of identifying the place, that Sir John purchased it, in the year 1834, from V. A. Schönnberg, and sold it in the year 1838 to Rice J. Jones. It is known by the name of Feldhausen.

About half-way up the north side of Wynberg Hill, there is a stone sunk into the ground; its upper oblong end is about sixteen inches above the surface, and the direction of its longer axis is towards the Blockhouse battery on Devilsberg. This stone is a boundary or land-mark, where four estates join, one of them being Sir John Herschel's. It is visible from the south avenue leading up to his front door, and onwards past the orchard, where the twenty-feet reflector and equatorial room stood. On the top of Wynberg Hill there is a huge weather-rounded granite rock, known by the name of "Wynberg Stone." The distance between it and the boundary stone is 2576 feet; and both are visible from the Royal Observatory.

The east end of Table Mountain and Devilsberg intervening between Cape Town and Sir John Herschel's position, it became necessary to choose a fourth station. Accordingly, "King's Blockhouse" battery, about half-way up the east face of Devilsberg, was fixed upon. The platform of the battery is paved with large flat stones, well cemented together with mortar, and is in good repair. It commands a view of the other stations and the base line.

The wings of the Royal Observatory are some feet higher than the meridian rooms; so that Cape Town cannot be seen from the shutter above the transit instrument, while the west dome intercepts a view of King's Blockhouse from the same point. I therefore chose a station on the west wing, and reduced the distances afterwards to the transit instrument.*

* See the plan of the triangulation in Plate III.

I was desirous, in the measurement of the base, to make it subservient to other useful purposes, particularly as the Rhineland measure, which has hitherto been employed in this colony, is so far a fiction, that there is no authorised standard in the Colonial Office for reference. But I found that the position of the line best adapted for the present purpose might not always be convenient for measurement by the chain; a second, therefore, was afterwards measured in a suitable position in Cape Town. The site of the base is on the sandy plain to the north of the Observatory. The east end is defined by the centre of the pillar serving for the north meridian mark of the transit-instrument, and the west by a gun. The line is so little elevated above the sea, that a large portion of it is covered by water at spring-tides. The Liesbeck stream intersects the line about one-fourth of its length from the meridian mark, over which a temporary platform was placed.

In the month of October 1836, I applied to Colonel Lewis, Commandant of the Royal Engineers, for an unserviceable gun, and for assistance in the measurement, which he readily granted; and I here acknowledge the alacrity displayed by the engineer department to meet my wishes on this and several other occasions, and to Sir Benjamin D'Urban, the governor, at the period alluded to, when I had occasion to trouble him. On the 10th of October, Lieut. Williams brought up the gun. A pit was dug, seven feet deep, in a slightly elevated mound, at the west end of the line. The bottom being well lined with stones and mortar, a large flat stone, hollowed in the centre for the reception of the gun, was let down; the gun was then lowered, and firmly fixed by ramming down the soil, about a foot of the muzzle being left above ground, and painted white. Almost the whole of the apparatus for the measurement was constructed at the Observatory; and although the screws, brass-work, &c. were homely in appearance, they answered the purpose very well.

The measuring rods were three in number (distinguished by the letters A, B, C), constructed of well-seasoned white deal, on the model of those employed by General Roy on Hounslow Heath, excepting a few minor details corresponding with the contemplated method of using them. The square brass ferule covering each extremity was perforated perpendicularly with a hole, three-eighths of an inch in diameter; the ferule was then driven on and firmly fixed. A brass screw, a quarter of an inch in diameter, and nearly two inches long, was passed into the wood through the hole

without touching the ferule, and both were ground down together perfectly flat. The screw-head was to carry the division that defined the length of the rod, and could only be affected by the expansion of the wood.

Eight tressels were constructed on the model of General Roy's, six of them having wood screws and moveable teak-wood tables. Also, teak-wood clamps with steel screws working in brass sockets, for clamping the rods to the tressels, and clamps with screws, for driving up the rods to adjustment, with the usual equipment of boning rods and pickets.

The standard rod was twenty feet long. It was only trussed laterally, but, to prevent vertical flexure, the depth was increased to eight inches, and it rested on a smooth plank, ten inches deep and three inches thick. Two stout brass plates, three inches long and five deep, were fixed to the sides near each end with bolts and nuts, for transferring the length of the rod to the measuring rods. Their tops projected two inches (the depth of the measuring rods) above the upper surface.

Five brass pins were screwed into the upper surface of the rod, four feet from each other, their tops ground down smooth to receive the divisions in laying off the rod.

A microscopic beam compass was contrived by fixing, with brass plates, a micrometer microscope to each end of a deal plank, four feet long. Two blocks were fixed to the beam, of such a depth, that, when they rested on a smooth surface, that surface was in the focus of the microscopes.

While these instruments were in progress, I had several consultations with Sir John Herschel, who, always ready to assist me with his advice, entered warmly into the contrivances for measuring the base. If there had been plenty of time and mechanical means for carrying one of the plans he proposed into effect, there is little doubt that the length of the base would have been determined as accurately as the standard rod, by means of the beam compass.

I had contrived to prevent the ends of the rods touching in the measurement, and proposed to measure the space between the divisions by means of a scale. He suggested the trial of making the space a constant quantity, which would prevent mistakes in registering, and which might be effected by a piece of mica. Accordingly a couple of crosses were drawn on a slip of mica, 2·3 inches, nearly, from each other, with a fine point; then, turning the divided surface downwards to prevent parallax, the crosses were seen

through the transparent mica like spider lines, and being placed over a fine line on brass, a neat bisection of the cross was easily effected. This contrivance was afterwards found to answer well in practice with the assistance of a common magnifier.

Every thing being ready by the 4th of April, 1837, for laying off the rods, the opportunity was offered to the Colonial Government for comparing their standard of measure with the brass scale at the Observatory, and some of the official gentlemen were invited to witness our proceedings. Accordingly Colonel Bell, the colonial secretary, Major Michel, the surveyor-general, Colonel Lewis and Lieut. Williams, of the Royal Engineers, and Sir J. Herschel, met at the Observatory. A straight line on the standard rod was defined by a fine silver wire stretched by means of a weight: where it passed over the brass heads, a line was drawn with a cutter. The brass scale was then removed from its case, and placed on the trussing of the rod, with a thermometer upon it, and another at some distance.

Sufficient time having been allowed for equalizing the temperature of the scale and the room, the beam compasses were placed upon the scale, and the micrometer screws turned until the first and last divisions of the scale bisected the cross wires. A zero division having been previously cut on the first brass head of the standard rod, the beam compass was transferred from the scale to the rod; and one of the microscopes was brought over the division, which was made to bisect the cross wire by gentle taps on the foot of the compass, taking care to keep the second microscope exactly over the longitudinal division on the second brass head. A T square, got up for this purpose, was then clamped to the rod, and the edge brought under the second microscope was made to bisect the cross wire; the cutter was then applied, and the second division drawn. The compass was now returned to the scale to verify the position of the wires. Thus the five lengths of the scale were laid off, the gentlemen present having an opportunity to examine each bisection before and after the cutter was applied.

The thermometer on the scale indicated $71^{\circ}\cdot 8$ at the beginning, and 72° at the termination: the temperature of the room as shewn by the distant thermometer was 72°.

For the purpose of transferring the first and last divisions to the upper edges of the brass plates, an oblong piece of teak-wood, of the depth and thickness of the measuring rods, with a thin brass plate screwed on its upper

surface, was smoothed, and its angles squared. A hole, half an inch in diameter, was drilled through it from above downwards, and a portion of the side cut away below to admit light. A piece of mica, with a cross-line on its under surface, was cemented on the lower end of the hole; so that, on looking through from above, the cross appeared in the centre of the field. The block being placed over one of the end divisions and clamped to the rod, the division was made to bisect the cross on the mica. The T square was now clamped to the upper surface of the block and brass plate of the rod, and a line was cut on both. The block was then removed to the other brass plate, and fixed as before over the division below, and the division on the top was continued to the brass plate by means of the T square and cutter.

It is obvious that the relative longitudinal distance between the cross on the mica and the line on the upper surface of the block, must be equal to the relative longitudinal distance of the divisions on the brass pin and the plate; consequently the length between the divisions on the plates was equal to the length between the divisions on the pins, provided the direction of the block was the same at both operations.

Other engagements interfering, I had not leisure to examine the standard rod until the 28th and 29th of May, 1837. The examination was then undertaken. The scale was placed on the trussing of the rod as formerly, and by means of the compasses each length of four feet was compared with the scale in rotation, as follows:—

Temperature of the scale, 59°·5; of the room, 59°·8.

1st interval	+ 28·2	divisions.
2d —	+ 24·2	—
3d —	+ 20·0	—
4th —	+ 24·2	—
5th —	+ 12·9	—
Sum	+ 109·5	

Run of micrometer B over one-tenth of an inch = 565·7 divisions.

A subsequent experiment gave 565·4 divisions.

Then $\frac{109{\cdot}5}{565{\cdot}7} \times 0^{\text{in}}{\cdot}1 = 0^{\text{in}}{\cdot}01936$, by which the standard rod appears to exceed 20 feet of the brass scale, both being at the temperature 59°·5.

The temperature engraved on the scale is 70°.

And suppose the expansion of white deal is ·0000022685 for 1° of Fahrenheit's scale.

— — of brass .... ·0000103077 — —

E

Then ·0000080392 × 240 × 10·5 = ·020259 is the estimated relative contraction of the rod with regard to the brass scale, for 10°·5 of the thermometer; and the difference, or ·0009, may be taken as the error of the rod at 70°.

Five comparisons gave the following results:—

Therm.	Computed Thermometrical relative contraction of the Deal Rod.	Observed Difference of the Rod and Scale.	
°	in.	in.	
59·5	0·02026	0·01936	by Mr. MACLEAR.
58·5	0·02219	0·02319	Ditto.
58·9	0·02142	0·02307	Mr. C. P. SMYTH.
58·75	0·02171	0·02202	Ditto.
58·9	0·02142	0·02206	Mr. MACLEAR.
Mean	0·02140	0·02194	

The difference between the two means, 0^{in}·00054, may be considered as the quantity by which the standard rod of 20 feet exceeds 20 feet of the brass scale, both being at the temperature of 70°.

The scale is by DOLLOND. It is a thin brass bar, inclosed in a mahogany case lined with green baize. Sir JOHN HERSCHEL was so good as to take charge of this scale, on his return to England, for the purpose of comparing it with the Royal Astronomical Society's Standard.*

The measurement of the base-line commenced on the 17th of June, 1837, in the presence of the gentlemen before mentioned, Sir JOHN HERSCHEL, Lieutenant WILLIAMS, Mr. C. P. SMYTH, and myself performing the work. The previous day was spent in boning the line, driving pickets, and the like preparations.

As the point on the meridian pillar, meant to define the east end of the line, was considerably elevated, a hole was drilled in a stone let into the ground close to the pillar, for a convenient starting point. Two tressels being placed in position and levelled, rod A was laid on; and a cylindrical plummet in the form of a tube, with cross-wires on the lower surface, was

* The 4-feet brass scale, here alluded to, was compared with the standard scale of the Royal Astronomical Society by Sir JOHN HERSCHEL and Mr. BAILY; and the mean of sixty-three comparisons shewed that the 4-feet brass scale is equal to 47·997083 inches of the standard yard of the Society. The comparisons were made on March 5th–9th, 1839, both days inclusive; the thermometer varying from 32°·8 to 44° during those days. The 4-feet scale was sometimes placed next to the observers, and at other times the Society's scale: and the comparisons were made with the two several 4-feet of the Society's scale. The results were very accordant and satisfactory. [I am informed by Mr. Baily that no correction was applied for temperature.—G. B. A.]

suspended from the end of the rod through a tin tube (to guard it against the wind) over the hole in the stone. The rod was then shifted until the cross wires, as seen from above through the plummet with an opera-glass, coincided with the centre of the hole. It was then clamped; and rod B being placed, the piece of mica, before mentioned, was laid on end 2 of rod A, and held down by a weight; by gentle taps on the weight, the division was made to bisect the cross. End 1 of rod B was now driven up until its division bisected the other cross; the rod was then clamped, and the bisection again examined. Rod C was in like manner brought into line, and the mica transferred to the junctions of B and C. As the rods were successively brought up and placed, the bisections were always re-examined before the mica was removed from its last position.

The twenty-inch transit was placed about the middle of the line directed towards the advancing rods; through the telescope the intervening cross-bars of the boning-rods were seen as one, the telescope being parallel to the horizon, and the axis on the same level with the bars.

Lozenge-shaped holes, in triangular pieces of wood of equal dimensions, were fixed to the rods, one at each end; so that by looking through one end of the series, a concentric line of gradually diminishing apertures would prove the rods to be in a right line. They were soon abandoned, for they were either not truly placed with reference to the axes of the rods, or the test was too delicate for practice: I believe the former to have been the case.

The progress this day was inconsiderable, in a great measure owing to the delay in levelling and adjusting the tressels where the ground was uneven and cut up by floods. A pig of lead, weighing fifty-six pounds, was sunk in the ground at the end of the twenty-seventh rod. The plummet being supended from the advancing end of the rod through the tube, a cross was cut on the lead and adjusted to the plummet, then covered with sand.

Lieutenant WILLIAMS, Mr. C. P. SMYTH, and myself, continued the measurement on the 18th; we were deprived of the valuable assistance of Sir JOHN HERSCHEL, who was suffering from the damp and cold of the preceding day, but he paid us a visit.

In the afternoon a brisk breeze sprung up from the N. W. I was in the act of adjusting the sixty-sixth rod, when a sudden gust blew it and the next off the tressels. I caught hold of the third and saved it. One was entirely destroyed; the other being clamped, the feet broke off close to the clamps

and it went over slowly. This accident compelled us to postpone the measurement until November; for, before a new rod could be made, and the other repaired, the winter had set in and the floods had spoiled the line, and we could not calculate upon four days' fine weather.

I may here remark that, although the contrivance adopted for preventing a similar accident proved effectual, rods of this description are unfitted for a windy country like the Cape; they are liable to short vibrations which no clamping can control. They should only be used in calm weather; but a continuance of such weather at the Cape is not very common. I certainly should be unwilling to hazard them on a six-mile line.

The measurement was recommenced from the meridian pillar on the 8th of November, 1837. Hooks were now fixed on the trussing of each rod, so that a cord could be linked on loose, the other end being attached to a weight resting on the ground. A 220-feet sash-line was stretched with the force of four men over the tops of the pickets to direct the advancing foot of each tressel, and was moved from time to time as the rods came up.

The party consisted of Lieutenant WILLIAMS, Mr. C. P. SMYTH, myself, JOSEPH GIBBS, two sappers, and a common labourer. Each confined himself to his assigned department of the work, which went on with regularity and precision.

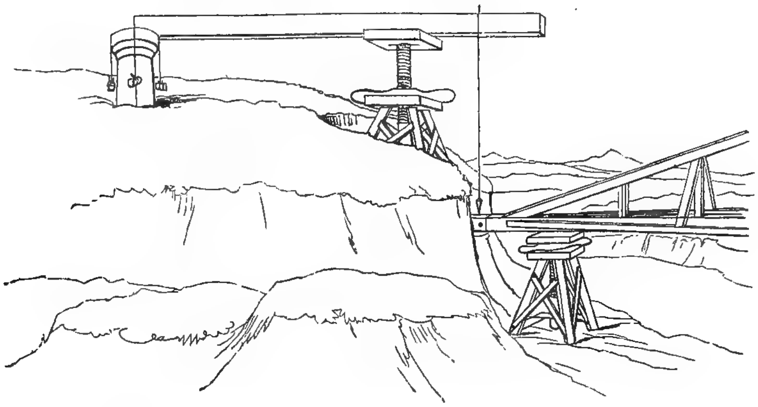
On reaching the twenty-seventh rod, the lead was uncovered that was placed there in June: the plummet fell short of the mark upon it nearly half an inch. It is not improbable that, as the place was frequently covered with water in the winter, the lead may have shifted. At sunset, a pig of lead was sunk in the ground at the end of the forty-sixth rod.

The next morning was foggy, but sufficiently clear to admit of the boning rods being seen. Towards one o'clock the tide unexpectedly flowed over the line immediately in advance, at the same time indications of approaching rain caused us to drop the plummet, having this day measured only twenty-eight rods.

The 10th was rainy; we resumed on the 11th late in the forenoon, and by sunset completed thirty-eight rods. We began at sunrise on the 13th, and reached the gun, marking the west end, at noon, having measured thirty-two rods.

The muzzle of the gun being considerably higher than the level of the rods, and the last rod falling short of the gun, a smooth deal plank was

levelled; one end resting on the gun at the intersection of the cross-wires stretched on the muzzle, the other on a tressel lowered into the ground. A



plumb-line was shifted along the plank until the apex of the bob coincided with the division on the last rod. The point of suspension being marked and afterwards measured at the Observatory, shewed that the last, or 144th rod, fell short of the gun $7^{ft}\ 10^{in}{\cdot}825$.

I should state that four equidistant grooves were cut in the muzzle with a file, to receive two wires stretched by weights. The intersection of the wires is supposed to be the centre of the muzzle.

To obtain the distance between the crosses on the mica employed in joining the ends of the rods, it was laid on the graduated ring of the mural circle; and the angular distance, measured by the microscopes of the instrument, gave $3^\circ\ 17'\ 16'' = 2^{in}{\cdot}2752$. But as it is difficult to observe the coincidence of the intersections of cross wires with cross lines of different inclinations, and as the mica, moreover, required to be held on with the hand, the result was discarded.

The mean of five measures on the brass scale gave $2^{in}{\cdot}3 - \frac{8{\cdot}88}{565{\cdot}4} \times 0^{in}{\cdot}1 = 2^{in}{\cdot}29843$, none differing from the mean more than $\frac{1}{5654}$ of an inch.

The distance between the divisions and extreme ends of the rods from which the plumb-line was occasionally dropped, proved to be,—

Rod A, end 1 =	1·034 inch.
2 =	1·018 —
Rod B, end 2 =	1·025 —
Rod C, end 2 =	1·050 —

At the commencement, rod A was first laid on; the line hung from end 1: at the twenty-seventh rod, the line hung from end 2 of rod C; a new elevation was there taken, and the next start was made from end 1 of A, leaving off at night from end 2 of A.

The sum of these is	= 4·136 inches.
Second day, Rod A, ends 1 and 2	= 2·052 —
Third day, Rod A, end 1; B, end 2 ..	= 2·059 —
Fourth day, Rod A, end 1	= 1·034 —

The rods were compared with the standard on the morning of the first day; they were of exactly the same length. The air all day was hot and dry. Mean of the thermometers attached to the rods, 83°.

The second day was foggy and moist. Mean of the thermometers, 65°. The rods were compared with the standard immediately after returning from the field, when the former were wet.

				in
Rod A	exceeded	the standard		0·012
— B	——	——		0·020
— C	——	——		0·025

On the morning of the third day,

Rod A	exceeded	the standard	0·012
— B	——	——	0·022
— C	——	——	0·025

Again, on returning,

Rod A	exceeded	the standard	0·025
— B	——	——	0·000
— C	——	——	0·011

This day was gloomy; mean of the thermometers, 68°·4.

Fourth day, in the afternoon,

Rod A	exceeded	the standard	0·000
— B	——	——	0·017
— C	——	——	0·025

The atmosphere dry and cloudy; mean of the thermometers, 71°·3.

On remarking the above variation, I was informed by those who removed the rods on the third morning from the room, that one of them encountered a brass plate of the standard. I immediately compared the plates with the divisions below on the brass heads, and found the distance between the latter longer than between the former by about $\frac{1}{40}$ of an inch, so that the indications

of the standard rod at the latter comparisons were less than they should be by that quantity.

The observed correction from the comparisons is + 0·294 inch.

The expansion of white deal on 20 feet is 0·000544 inch for 1° of Fahrenheit. The temperature of the large room where the standard was kept, was almost uniformly 65°; then the computed reduction of the base to the standard rod will be,

1st day	·000544	× 46 ×	$\overline{83°·0 - 65°}$	= + 0·4504
2d —	——	× 28 ×	$\overline{65° - 65°}$	= 0·0000
3d —	——	× 38 ×	$\overline{68°·4 - 65°}$	= + 0·0703
4th —	——	× 32 ×	$\overline{71°·3 - 65°}$	= + 0·1097
			Sum................	= + 0·6304

The *computed* correction was adopted.

LENGTH OF THE BASE.

	ft.	in.	ft.	in.
1st day, 46 rods	=920			
4 plumb-line values	0	4·136	928	9·267
44 mica lengths	8	5·131		
2d day, 28 rods	=560			
2 plumb-line values	0	2·052	565	4·110
27 mica lengths	5	2·058		
3d day, 38 rods	=760			
2 plumb-line values	0	2·059	767	3·101
37 mica lengths	7	1·042		
4th day, 32 rods	=640			
1 plumb-line value	0	1·034		
31 mica lengths	5	11·251	653	11·110
Deal plank	7	10·825		
Correction for temperature of measuring rods to 65°		+0·630		
Correction for temperature of standard rod, from 65° to 70°		−0·392	0	0·316
Correction for error of standard rod at 70°		+0·078		
Length of base as it would be shewn by the brass scale, supposing it used at the temperature 70° of Fahrenheit			= 2915	3·904
			= 2915·325	

The east-end base-signal, when I was measuring the angles, was placed over the stone from which the base-measure was begun; therefore the above

value was used in the triangulation. Subsequently the distance between the stone and the intersection of two diagonal lines, drawn on the top of the pillar, was ascertained (by suspending a plummet from a plank) to be $4^{ft.}\cdot040$: therefore the distance between the centre of the gun and the centre of the pillar appears to be $2919^{ft.}\cdot365$.

The angles were measured in the latter part of 1836, while the apparatus for measuring the base-line was in progress. I employed the repeating instrument by DOLLOND, described in the first volume of the *Memoirs of the Royal Astronomical Society*. The "tell-tale" level, for checking a shift in the horizontal circle while the verniers are moved, was in England for repair. I had calculated upon receiving it in time for this work, but was finally compelled to proceed without it, adopting whatever precautionary measures I could think of; such as always driving the tangent screw in one direction, and repeating backward as well as forward.

In the employment of this instrument for measuring horizontal angles, it is presumed that the stand is secure against horizontal flexure or shift, over which the "tell-tale" level can have no control. To guard against this danger, I had a heavy stand constructed of teak-wood, the legs braced with cross bars; and, to increase their steadiness, a 14 lb. weight was attached to each. Three conical grooves of brass were let into the top of the stand, the direction of the grooves coinciding with three lines at equal angles radiating from the centre of the top. The feet of the instrument readily fell into their places in these grooves, and were equally strained during the motion of the verniers.

This instrument is very powerful for its dimensions. As an altitude instrument, its precision is astonishing; and if a telescope could be attached to the horizontal circle, I should not hesitate to use it on the most extensive survey. A fair mean was taken of all the measures of each angle, and as all the angles were measured, I had the usual check on the work; yet, on the return of the level from England, I thought it right to repeat those of the base-line. The difference was trifling.

The signals on the Blockhouse Battery, Observatory, and base-line stations, were tripods surrounded by hoops, and covered with white cloth. They were placed over their respective stations by means of a plummet suspended from the inside of their conical tops. The signal at Mrs. DE WITT's was a circular disc painted on the east chimney. This chimney is

narrow, and the distance considerable. The disc, as seen from the Observatory, coincides with the centre of the chimney; as seen from the Blockhouse it is a trifling distance to the right. The Blockhouse signal was twice destroyed by wind; finally, a disc projecting from an arm was nailed to the chimney behind the battery, and the angles were reduced to the first station on the battery.

OBSERVATORY STATION.

On the west wing, 33ft 8in·5 to the north of the dome. The place of the plummet-point (defining the position of the axis of the circle) is marked on the lead.

1836.	Nov. 23	Angle between Sir J. Herschel's Boundary-stone and King's Blockhouse, 10 repetitions........	39° 0′ 33″·3
	Nov. 23 Dec. 2	Angle between east end of Base and west end of Base, 92 repetitions	42 15 22·62
1837.	[Day not entered].	The same, 40 repetitions	42 15 22·75
1836.	Dec. 2 19	Angle between Blockhouse and west end of Base, 46 repetitions	84 35 13·57

Remark.*—The observations of Dec. 19 were made on the disc on the Battery Chimney, 33ft·349 from the station on the platform of the Battery. The azimuth of the disc (as seen from the platform), measured from the centre of the dome in the direction of N.E.S.W., is 156° 17′ 5″. The Reduction adopted in forming the number above is + 4′ 32″·98.

	Dec. 2 9	Angle between Blockhouse and Mrs. De Witt's Chimney, 44 repetitions	51° 52′ 54″·71

EAST END OF BASE.

The circle placed over the stone close to the Meridian Pillar.

1836.	Nov. 23 Dec. 12	Angle between Observatory and west end of Base, 73 repetitions..........................	101° 55′ 16″·57

* This remark stands thus in the MS.:—"Those of Dec. 19 from the disc on the Battery "Chimney 33ft·349 from the station on the platform. N.E. bearing of the centre of the dome as "seen from the platform 156° 17′ 5″. Reduction + 4′ 32″·98."

I have altered the wording in the only way in which the remark can have any meaning, with due reference to the numerical values. It would seem however that, either the direction of the azimuth ought to be opposite to that which I have assumed, or the sign of the reduction ought to be changed. The numbers also would agree better if the azimuth angle were 156° 57′ 5″. But this is not important, as the values of the angles of the triangle are given in the text as finally corrected.—G. B. A.

WEST END OF BASE.

The plummet of the circle 11 inches from the intersection of the cross-wires on the muzzle of the gun. The gun, as seen from the circle, bore 30° 43′ to the left of the Meridian Pillar (east end of Base).

1836.	Nov. 23 – Dec. 12	Angle between Observatory and east end of Base, 31 repetitions (Reduction + 7″·76)	35° 49′ 16″·93
1837.	[Date not entered]	With "tell-tale" level, 41 repetitions. The axis of the circle over the centre of the muzzle	35 49 21·54
1836.	Nov. 23 – Dec. 12	Angle between Observatory and Blockhouse, 23 repetitions (Reduction, — 28″·66)	71 22 2·20

PLATFORM OF KING'S BLOCKHOUSE BATTERY.

The axis of the circle over a hole drilled into one of the paving-stones.

1836.	Dec. 1.	Angle between Observatory and Mrs. De Witt's Chimney, 19 repetitions	92° 51′ 38″·05
		Angle between Observatory and west end of Base, 33 repetitions	24 2 47·02
		Angle between Observatory and Sir John Herschel's Boundary-stone, 26 repetitions	117 4 57·71

ROOF OF MRS. DE WITT'S HOUSE.

Circle placed 9ft 4in from the centre of the chimney, which bore 43° 48′ to the right of the signal on the Blockhouse Battery.

The signal on the west wing of the Observatory invisible. Bisected the second window from the north, of the lantern over the Sector-room.

The window observed is 47ft 8in from the Roof-station, and *on that station* the window bore 161° 58′ 56″ from Mrs. De Witt's Chimney.

Nov. 25.	Angle between the Lantern-window and King's Blockhouse, 119 repetitions	35° 18′ 10″·77
	Reduction of window to station on west wing	— 2 58·19
	Reduction to centre (from the actual position of the circle to Mrs. De Witt's Chimney)	+ 0 11·65
	True angle	35 15 24·23

SIR JOHN HERSCHEL'S BOUNDARY-STONE STATION.

The axis of the circle six inches due west of the centre of the stone.

Nov. 28.	Angle between the King's Blockhouse Battery and Observatory, 100 repetitions (Red. + 4″·76) ..	23° 54′ 30″·08

RESULTS.

	Angles observed.	Angles used in calculation.
Observatory	42° 15′ 22″·7	42° 15′ 23″
East end of base	101 55 16·7	101 55 16
West end of base	35 49 19·6	35 49 21
Sum of angles	179 59 59	180 0 0
Base line		2915·325 feet.
Observatory to east end of base		2537·396 —
——— to west end of base		4241·881 —
Observatory	84° 35′ 13″·6	84° 35′ 12″
King's Blockhouse	24 2 47	24 2 46
West end of base	71 22 2·2	71 22 2
Sum of angles	180 0 2·8	180 0 0
Blockhouse to west end of base		10363·817 feet.
——— to Observatory		9864·600 —
Observatory	51° 52′ 54″·7	51° 52′ 58″
King's Blockhouse	92 51 38·1	92 51 38
Mrs. De Witt's Chimney	35 15 24·2	35 15 24
Sum of angles	179 59 57	180 0 0
Observatory to Mrs. De Witt's Chimney		17067·951 feet.
King's Blockhouse to ditto		13444·955 —
Observatory	39° 0′ 33″·3	39° 0′ 33″
King's Blockhouse	117 4 57·7	117 4 57
Sir J. Herschel's Boundary-stone	23 54 30·1	23 54 30
Sum of angles	180 0 1·1	180 0 0
Observatory to Sir J. Herschel's Boundary-stone		21671·645 feet.
King's Blockhouse to ditto		15321·025 —

To measure *direct,* from a point immediately above the middle of the axis of the transit instrument, the angle between Mrs. De Witt's chimney and the dot on the meridian pillar in the meridian of the ten-feet transit instrument, or the azimuth of the chimney as seen from the middle of the transit axis, a high stage would be required on the roof of the transit-room, which would not only incur considerable expense, but would be attended with risk, where there is so much danger from the force of the wind. I therefore preferred measuring the angle between these objects on the west wing, and reducing it to the transit instrument.

I measured on the west wing the angle between the signal at the east end

of the base and the dot on the pillar. Ten repetitions gave 6′ 47″·7. Applying this quantity to the angle between the chimney and signal derived from the preceding angles, the angle between the chimney and the dot, as observed on the west-wing station, is 75° 4′ 29″·3. The same was measured direct. Forty repetitions gave 75° 4′ 39″·1.

The distance between the west-wing station and a plumb-line dropped on the intersection of the axes of the transit instrument, carefully measured with a trussed rod, levelled by means of a spirit level, was found to be 28ft 1in·81.

The angle as observed on the west wing	between the meridian dot and plumb-line	93° 11′ 17″
——	between Mrs. De Witt's Chimney and plumb-line	191 45 35
——	between Sir J. Herschel's Boundary-stone and plumb-line	100 51 55

Therefore, the reduction to the transit instrument for Mrs. De Witt's Chimney is − 36′ 54″·2 ; and, adopting 75° 4′ 39″·1,

The azimuth of the chimney from the north towards the west, as seen from the transit instrument, is	74° 27′ 44″·9
The distance between the chimney and transit instrument	17096 feet.

Therefore the chimney is 4579ft·5 north from the perpendicular.
And 16471 ·1 west from the meridian.

Assuming the compression $\frac{1}{298}$, 1″ in lat. 33° 56′ = 101ft·739; therefore the difference in latitude = 45″·01 : and, if the latitude of the Royal Observatory is 33° 56′ 3″·25, the latitude of the chimney is 33° 55′ 18″·24.

The chimney is southwesterly of the supposed sight of La Caille's Observatory about 120 feet, or, reduced to the meridian of the Observatory, 115 feet; consequently, the latitude of La Caille's Observatory is 33° 55′ 17″·11. La Caille assumed it to be 33° 55′ 15″.*

* La Caille first adopted for his latitude 33° 55′ 14″·5 or 33° 55′ 15″, in the *Memoirs of the Academy of Sciences* for 1751, pages 411 and 412 : but on revising his computations in the *Fundamenta Astronomiæ*, published in 1757, he found it to be 33° 55′ 13″·3 : and in a paper, read to the Academy of Sciences in 1756, but revised and read again in 1758, and published in 1761, in the volume of the *Memoirs* for 1755, page 569, he latterly determined the latitude to be 33° 55′ 12″·6. And the Baron de Zach states that, on recomputing the observations of La Caille, he found the latitude to be 33° 55′ 12″·45.—(Zach's *Correspondance Astronomique*, vol. iii. p. 615). [For this note I am indebted to Professor Henderson.—G. B. A.]

The angle at the west-wing station, between Sir JOHN HERSCHEL'S Boundary-stone and the dot in the meridian of the transit-instrument, computed from angles already observed, is	165° 57′ 57″·3
The same observed direct, 31 repetitions	165 57 49·8
The supplement (eastward) observed direct, 14 repetitions	194 1 54·7
Reduction to the transit instrument	0 42 26·44

Adopting the direct observations, we have

Azimuth from north, westward, as seen from the transit instrument	165 15 23·4
——— eastward	194 44 21·1
Defect from 360°=15″·5.	

The stone is visible from the roof of the transit instrument; but the form of the shutter prevented the axis of the circle being placed exactly over the instrument. The plummet fell 8·5 inches to the east, and 3 inches north; therefore the reduction is 63″·4: this is applied to form the following numbers:—

Six repetitions westward, on the roof of the transit instrument, gave	165° 15′ 30″·5
——— eastward, gave	194 44 14·1
Defect from 360° = 15″·4.	

I cannot explain this defect, which is constant for both stations, on any other hypothesis than a drag of the lower circle, or stand.

The stone was whitewashed, and the observations from the transit-roof were made on a gloomy morning, when there could not be any deception from a phase of the signal.

The mean of the results for eastward angle, from the direct observations on the west wing, is 194° 44′ 28″·85: that from the direct observations on the roof of the transit instrument is 194° 44′ 21″·8. The mean of these two, giving them the respective weights 45 and 12 (the whole number of direct observations at each place) is 194° 44′ 27″·3, or the azimuth of the stone from the south point westward is 14° 44′ 27″·3. And the distance from the meridian, 5514·3 feet to the west; from the perpendicular, 20958·4 feet to the south.

It may not be amiss to introduce the continuation of the triangulation from the boundary-stone, to the south avenue leading up to Sir JOHN HERSCHEL'S house, made by Sir JOHN HERSCHEL himself, with a small theodolite. The angle between "Wynberg stone" and the Boundary-stone, observed on

the west-wing station with DOLLOND'S circle, is 5° 9′ 33″·44. Between the centre of the chimney of the Block-house Battery and "Wynberg stone," 33° 54′ 21″·62. The nearest distance between the centre of the west dome and the line of sight to the former, 9^{ft} 0^{in}·6; the same to the latter, 12^{ft} 3^{in}.

Sir JOHN measured a small base-line in his avenue of 516^{ft}·21; and he found, by observation, the following angles (they are corrected for calculation):—

BOUNDARY-STONE STATION.

	°	′	″
Between both ends of base	7	16	52
Between Wynberg Stone and Royal Observatory	125	41	28
Between Wynberg Stone and north-west end of base	122	28	40

"WYNBERG STONE" STATION.

Between Royal Observatory and Boundary-stone	49	8	59
Between Boundary-stone and north-west end of base	30	4	46

SOUTH-EAST END OF BASE STATION.

Between Boundary-stone and north-west end of base	136	32	6

NORTH-WEST END OF BASE STATION.

Between Boundary-stone and south-east end of base	36	11	2
Between Boundary-stone and "Wynberg stone"	27	26	34

Hence,

	ft
Distance between Observatory station and "Wynberg stone"	= 23268·90
—— between Boundary-stone and "Wynberg stone"	= 2576·45
—— between Boundary-stone and east end of base	= 2404·65
—— between Boundary-stone and west end of base	= 2801·88
—— between "Wynberg stone" and the Boundary-stone, calculated from the Observatory base-line	= 2576·30

The difference between the determinations of the distance between the Wynberg and Boundary stones, from the two base-lines, is only 1^{in}·8.

I may here mention, that, in the expected triangulation round Table Mountain, for the purpose of obtaining the difference of latitude between the sector stations on the north and south sides of the mountain, there will be an opportunity of intersecting the roof of the dwelling-house from two points.

Sir J. HERSCHEL further found, by prolonging his base above mentioned, and letting fall on it a perpendicular from the centre of the twenty-feet

reflector, the following values of the co-ordinates of that centre, as referred to the base:—

	ft
Abscissa = distance of the perpendicular from the north-west extremity of the base, in the direction of the base continued	551·04
Ordinate = perpendicular offset to centre of the reflector	56·69

In like manner were the co-ordinates of the centre of the equatorial instrument (supposed coincident with that of the circular building containing it) ascertained, as follow:—

	ft
Abscissa = distance from the north-west extremity of the base, of a perpendicular let fall on its prolongation from the centre of building	= 645·73
Ordinate = perpendicular offset to centre	= 95·86

§ 6. Triangulation for connecting La Caille's Sector-Station at Klyp Fonteyn, the Modern Sector-Station, and the Neighbouring Hills.

The Klyp Fonteyn station is in the north-east corner of Zwartland Plain, where a range of high mountains, twelve or fifteen miles long, known by the name of Picquet Berg, abruptly terminates.

La Caille's map in the *Mém. de l'Académie*, **1751**, shews this range continued further to the north, which inclines me to think he neither ascended that mountain nor journeyed north of the farm.

About half a mile north of the parallel of the farm, the mountain makes a sudden turn to the west, and terminates in a kloof or valley to the north of and in the meridian of La Caille's station. The north front of this turn is steep, like a gigantic wall, nearly as perpendicular as the north front of Table Mountain, and, from the ground below, cannot be less than **2500** feet high.

From the before-mentioned valley, another mountain rises on the west, running, first west, about a mile, then north-west, where it terminates in Zwartland Plain. This is the "montagne sans nom" of La Caille. To the north of it, close up, there are two or three irregular masses; these gradually dwindle into an undulating ridge of low hills northwards, about ten or twelve miles.

Near their north extremity, a very remarkable-shaped mountain rises from the plain, called "Little Table Mountain" (Kleintze Tafel Berg). There is no eminence north of this one nearer than fifty or sixty miles.

But to the N.N.E. of Klyp Fonteyn, the country undulates for a considerable distance; and, fifty or sixty miles off, there are several very high mountains.

Lieut. WILLIAMS and myself started off on horseback, with the intention of exploring the nature of the country north of Klyp Fonteyn. We did not find it necessary to go further than "Little Table Mountain." From a comparatively low hill near to it, we had an uninterrupted view to the north of about sixty miles, over a plain, apparently of loose sand, covered with brushwood, bounded by the sea-shore on the west, and on the north-east by undulating hills and the mountains before-mentioned. Returning, we had a good view of the north extremity of Picquet Berg and the "nameless mountain."

Some weeks would be required to make a perfect survey of the mountains about this station. I did not, therefore, attempt to carry a chain of triangles round them, as I had other pressing engagements that could not be postponed. But I ascertained the heights, distances, and bearings of the culminating points with considerable exactness; and from these a map was made, which will convey an idea of their form and their probable influence on the zenith distances.

They consist almost entirely of solid rock with little interstitial earthy matter, sandstone mixed with quartz; specimens of which are transmitted with this communication. The inclination of the strata is westward, and above 20°. Their tops are rugged, with irregular masses of naked rock. There is no hill of consequence from the west point to twelve degrees east of south, nearer than Zwartberg.

LA CAILLE's station is on the rise of a hill, inclosed within the corner formed by the westward turn of Picquet Berg. This hill, which he does not mention in his *Journal*, like the rest, is composed of sandstone; and its top rises 700 feet above the granary. Some of the rocks at its base are within ninety yards of the station: indeed, the latter may be understood as placed on the west slope of a mountain of solid rock, at an elevation of 400 feet above the level of the sea.

The circle and BRADLEY's sector were placed on the corn-floor, on JACOBUS COTSEE's foundation, before the foundation of the granary was discovered; and, as the place was comparatively convenient, and the influence of the surrounding masses nearly common to both, I went on where I began.

I soon found that I must distinguish the several masses from each other by names, to prevent confusion in the entries.* Accordingly, the "mountain without a name" was called "Castle Hill," from a remarkable rock on the nearest summit resembling a castle. The mountain close to the sector, "La Caille's Mount." The west termination of Picquet Berg, "Hunchback," from its figure. A mass of rock to the south, in the plain, with three remarkable peaks, the "Three Bernoullis," Daniel being the middle one. Another mass, eleven degrees more to the west, which resembled a fortification, "Fort Azimuth;" for, on its west summit, there is a sharply defined conical rock, which supplied an excellent natural and permanent signal. This rock was compared with the sun, to get the direction of the meridian, and the angles all round were connected with it.

The station may be recovered at any future time from the bearings and distances of Fort Azimuth, the three Bernoullis, the north culminating point of La Caille's Mount, the south culminating point of the same, two rocks near the station, a group of rocks above the spring, and the Castle. Besides, a pit was dug in the corn-floor, under the axis of the sector, three feet and a half deep, where the rock was met with. A hollow was chiselled in the rock to receive a quart bottle, containing the following memorandum, written in large round hand:—

"BRADLEY'S 13½-feet zenith sector was placed over this spot (supposed to be the north extremity of LA CAILLE'S arc of the meridian), for the purpose of verifying the astronomical portion of that work, on the 27th day of March, 1838. The observations began on Wednesday, the 28th, and continued to the 21st day of April, when the instrument was taken down.

"The party consisted of THOMAS MACLEAR, H.M. Astronomer; Lieut. WILLIAMS, Royal Engineers; J. SMITH, Serjeant, Royal Engineers; — SHARPE, Gunner, Royal Artillery; JOSEPH GIBBS, Carpenter and Labourer to the Royal Observatory; CONRAD ENGELBRAGHT, JOHNNY WALLACE, Servants.

Signed by "THOMAS MACLEAR.
"JOHN WILLIAMS."

On the other side of the paper:—

"Over this there is a stone $1^{ft}\ 11^{in}$ long, 13½ inches in breadth, and 5½ inches deep, with the letters B^{Y} S^{T} 1838. Whoever disturbs this is requested to replace it with care, and to notice the circumstance."

* See the sketches and elevations in Plates IV. and V., and the triangulation in Plate VI.

The scroll was inclosed in a piece of blotting paper, and then covered with a thick coat of sealing-wax. The bottle being warmed, the scroll was introduced, and the cork covered with sealing-wax. The bottle was then rolled up in a cloth dipped in tar, and placed in the hollow cut out of the rock at the bottom of the pit, and covered over with the stone above described, over which the earth was rammed down firm, and the surface smoothed as before. Mr. LAMBRITZ, nephew of JERRIT COTSEE, and HENDRICK THIARK, the proprietor, were made acquainted with the object of the memorandum.

The position of the repeating circle was exactly 21^{ft} 11^{in} eastward of the spindle of the sector. Before it was placed, a perpendicular was drawn to the face of the sector, on which the plummet of the circle was dropped.

The base-line was measured by Lieut. WILLIAMS and the sappers, on the plain to the west, with a common Gunter's chain. They went over the line seven times to get rid of inconstant errors. The temperature of the ground was 85°. The chain, in the temperature 57°, was found to be 66^{ft} $1^{in}\cdot1$. The mean of the seven measures was 27^{ch} 1^{in}; consequently, the length of the base was $1784^{ft}\cdot907$. Only one artificial signal was put up, viz. a flagstaff on Castle Hill, towards the furthest extremity.

CIRCLE STATION NEAR SECTOR.

	°	′	″
Angle between signal rock on Fort Azimuth and south end of base, 24 repetitions	62	2	37·5
Angle between north and south ends of base, 26 repetitions	42	41	8·5
Angle between south end of base and flagstaff on Castle Hill, 19 repetitions	97	44	21·3

Theodolite readings for all the points observed in a sweep round (the angle between any two points may be obtained by taking the difference of their readings):—

	°	′	″
Reading for culminating rock at north end of La Caille's foot	0	1	12
—— for culminating rock at south end of ditto	6	5	40
—— for north rock of La Caille's Mount	45	40	30
—— for middle	51	16	20
—— for south	54	0	0
—— for middle of a large rock, distant from the circle $263^{ft}\cdot7$	58	11	20

CIRCLE STATION NEAR SECTOR (*continued*).

		°	′	″
Reading	for a large rock, which, in the line of sight, appears to be the termination of the range south-east of the circle; it is distant $324^{ft}\cdot5$	82	35	30
——	for Daniel Bernoulli	106	41	0
——	for Fort Azimuth signal-stone	117	33	10
——	for the culminating point of the apparent west termination of Castle Hill	274	41	0
——	for flagstaff on the third peak from the west, of Castle Hill	277	20	10
——	for Castle Rock, west end, 285° 36′ 0″; —— east end, 287 9 10	286	22	35
——	for a large group of stones (or rocks) on the lower part of Castle Hill, immediately above the spot where the water springs from the ground; they are in a line with a group of willow-trees (the middle large rock observed)	304	50	0
——	for the apparent middle of the Kloof between Castle Hill and the Hunchback termination of Picquet Berg	323	4	20
——	for first object, or starting point	360	1	10

SECOND SWEEP.

Reading	for signal rock on Fort Azimuth	0	1	18
——	for second peak on Riebeck's Castel, LA CAILLE's signal station; it just emerges above Zwartberg	1	15	40
——	for culminating point of Dassenberg	8	23	33
——	for a very distant culminating peak, Drakenstein (?)	8	39	36
——	for knob on a distant Hunchback mountain	8	59	0
——	for culminating point of Baviansberg	23	47	10
——	for culminating point of Katzenberg	24	52	20
——	for niche between Baviansberg and Katzenberg	26	11	30
——	for culminating point of Contre Berg	26	44	20
——	for culminating point of another mountain	27	36	0
——	for west escarpment of Table Mountain	28	46	32
——	for culminating point of Capoc Berg	31	18	40
——	for culminating point of Klyp Berg	36	37	10
——	for a whale-back looking mountain	48	38	50
——	for a small moundlike hill	60	17	30
——	for a hill towards Saldanha Bay	66	49	0
——	for another	69	43	0
——	for 1st of four flagstaves at the corners of OKER SCHALKEVECK's ruined dwelling house	202	39	48
——	for 2d	205	23	8
——	for 3d	207	52	35
——	for 4th	211	25	58

CIRCLE STATION NEAR SECTOR (*continued*).

		°	′	″
Reading	for La Caille's Foot	243	52	40
——	for La Caille's Head	248	32	53
——	for niche on James Bernoulli	348	4	43
——	for Daniel Bernoulli	349	8	3
——	for John Bernoulli	350	39	7
——	for a large rock on Picquet Berg	328	45	20
——	for Fort Azimuth, the starting point	360	0	45

Drag on circle, — 33″

ZENITH DISTANCES.

The observations were made thus:—

Vernier A clamped to zero (the mean of the three verniers is then constantly 9″, subtractive); contact made and level adjusted; circle turned half-round in azimuth; verniers unclamped; second contact made (level-bubble brought to centre, if necessary, by the foot-screw previously); the reading is double the zen. dist.

		°	′	″
Zenith distance	of north extremity of La Caille's Mount	75	38	27·7
——	of middle peak	75	41	33·9
——	of Daniel Bernoulli	88	21	51·4
——	of signal rock on Fort Azimuth	89	49	41·4
——	of second peak on Riebeck's Castel	89	42	42·2
——	of flagstaff on Castle Hill (the culminating point of the mountain), 4 repetitions	83	51	39·0
——	of second peak on Castle Hill from west, 4 repetitions	82	16	25·6
——	of Castle Rock on Castle Hill, 4 repetitions	81	53	16·8

NORTH END OF BASE.

HORIZONTAL ANGLES.

		°	′	″
Angle between south end of base and signal at station near sector,	7 repetitions	55	56	2·6
——	culminating point of Picquet Berg, 7 repetitions	57	16	7·7
——	rock above sector	63	47	45
——	vertical group	60	52	10
——	north peak of La Caille's Mount	53	49	36
——	middle peak	51	25	54
——	south peak	49	49	23
——	Daniel Bernoulli	3	10	27
——	Fort Azimuth (westward)	5	55	54

NORTH END OF BASE (*continued*).

Angle between south end of base and	flagstaff on Castle Hill (westward)	196° 59′ 38″
——	Hunchback termination of Picquet Berg	92 13 48
——	group of rocks over Klyp Fonteyn spring..........	88 53 0

ZENITH DISTANCES.

Zenith distance	of culminating point of Picquet Berg, 4 repetitions ..	83 14 35·5
——	of flagstaff on Castle Hill, 4 repetitions	82 15 31·5
——	of Castle Rock..............................	80 0 46·4
——	of Hunchback termination of Picquet Berg	83 57 50·5
——	of rock on La Caille's Foot, immediately above sector station	85 21 40·5
——	of north culminating point of La Caille's Head	83 20 33·9
——	of south do. do.	83 13 16·4
——	of Daniel Bernoulli	88 12 43·0
——	of Fort Azimuth signal	89 28 12·2

SOUTH END OF BASE.

HORIZONTAL ANGLES.

Angle between north end of base and	flagstaff on Castle Hill........	13 33 28
——	signal at station near sector, 5 repetitions	81 23 24
——	culminating point of Picquet Berg, 3 repetitions	117 4 44·5
——	Daniel Bernoulli	176 15 53
——	Fort Azimuth (eastward)......	187 6 27
——	north peak of La Caille's Head	106 29 53
——	middle do.	109 51 53
——	south do.	117 3 13
——	Hunchback termination of Picquet Berg	73 33 40
——	north culminating point, La Caille's Foot............	83 1 0
——	south do.	88 35 0
——	centre of Castle Rock	32 10 0

SOUTH END OF BASE (*continued*)

ZENITH DISTANCES.

Zenith distance of flagstaff on Castle Hill, 8 repetitions	....	83° 48′ 29″·3
——— of culminating point of Picquet Berg	....	82 54 44·7 !
——— do. do.	....	82 54 26·5
——— of south peak of La Caille's Head	....	81 52 8·9 !
——— of south peak of La Caille's Foot	....	84 47 18·9
——— of north do.	....	84 58 0
——— of Hunchback termination of Picquet Berg	....	84 5 17·2
——— of Daniel Bernoulli	....	87 53 18
——— of Fort Azimuth	....	89 16 45·6

The last observation uncertain, for the day was closing in fast.

RESULTS.

	Angles observed.	Angles used in calculation.
Station near sector	42°41′ 8″·5	42°41′ 8″
North end of base	55 56 2 ·6	55 55 46
South end of base	81 23 24 ·0	81 23 6
Sum of angles	180 0 35 ·1	180 0 0

Base	1784·907	feet.
Station near sector to north end of base	2603·0	—
——— to south end of base	2180·8	—

	Angles used in calculation.
Picquet Berg	5°39′ 8″
South end of base......	117 4 44
North end of base......	57 16 8
Sum of angles ..	180 0 0

Picquet Berg to north end of base	16136·13	feet.
——— to south end of base	15245·15	—
——— to station near sector..............	13533·13	—

Castle Hill flagstaff	17°52′ 31″	Castle Hill flagstaff......	14°26′ 1″
Station near sector	55 3 13	Station near sector	97 44 21
North end of base*......	107 4 16	South end of base	67 49 38

* The angle given in the MS is 107° 4′ 36″; but this is inconsistent with the observations at the north end, and gives an erroneous quantity for the sum of the three angles. It has however, apparently, been used in computing the side "flagstaff to sector by north end," but the error is insensible; the side ought to be increased about 0^{ft}·2.—G. B. A.

RESULTS (*continued*).

Castle Hill flagstaff	to north end of base	6951·22 feet.	
———	to south end of base	8670·00 —	
———	to station near sector, by north end of base	8106·45	8104·33 feet.
———	to station near sector, by south end of base	8102·20	

Fort Azimuth	13° 24′ 34″	Fort Azimuth	12° 14′ 1″
Station near sector	104 43 46	Station near sector	62 2 38
North end of base	61 51 40	South end of base	105 43 21

Fort Azimuth	to north end of base	10855·41 feet.	
———	to south end of base	9090·75 —	
———	to station near sector, by north end of base	9897·64	9902·16 feet.
———	to station near sector, by south end of base	9906·67	

Hunchback termination of Picquet Berg	14° 12′ 32″
North end of base	92 13 48
South end of base	73 33 40

Hunchback	to south end of base	7266·24 feet.
——	to north end of base	6974·50 —
——	to station near sector	5114·38 —

Daniel Bernoulli	11° 38′ 45″	Daniel Bernoulli	12° 12′ 24″
Station near sector	115 35 56	Station near sector	72 54 49
North end of base	52 45 19	South end of base	94 52 47

Daniel Bernoulli	to north end of base	11629·23 feet.	
———	south end of base	9858·86	
———	station near sector, by north end of base	10265·16	10270·94 feet.
———	station near sector, by south end of base	10276·71	

North peak of La Caille's Mount	19° 40′ 31″
South end of base	106 29 53
North end of base	53 49 36

North peak	to north end of base	5083·10 feet.
——	south end of base	4279·44 —
——	station near sector	2483·70 —

Middle peak of La Caille's Mount	18° 42′ 13″
North end of base	51 25 54
South end of base	109 51 53

Middle peak	to north end of base	5234·94 feet.
———	south end of base	4351·97 —
———	station near sector	2647·84 —

RESULTS (*continued*).

South peak of La Caille's Mount	13°	7′	24″
South end of base	117	3	13
North end of base	49	49	23
South peak to north end of base .... 7001·19 feet.			
——— south end of base .... 6006·67 —			
——— station near sector ...... 4421·80 —			
Castle Rock	24°	0′	7″
South end of base	49	13	6
Station near sector..............................	106	46	47
Castle Rock to south end of base .... 5133·0 feet.			
——— station near sector........ 4059·6 —			

Several points on La Caille's Mount were observed from the station near the sector, and *apparently* the same points were observed at the ends of the base line; but, from the contiguity of the hill to the sector, the culminating points were somewhat hid. The observations at the end of the base line are therefore preferred in the computations.

OBSERVATIONS AT THE STATION NEAR THE SECTOR, FOR THE AZIMUTH OF FORT AZIMUTH.

Tuesday, April 24, 1838. Comparison of the sun in azimuth with Fort Azimuth:—

	°	′	″
Reading of horizontal circle for Fort Azimuth	359	59	38·3
——— sun's preceding limb,* at $19^h\ 43^m\ 41^s{\cdot}5$ by chron. (angles increasing from N. to E.)	269	43	30
——— sun's following limb, at $19^h\ 45^m\ 15^s$........	270	1	43·3
Azimuth of sun's preceding limb from Fort Azimuth, at first observation (increasing from S. to E.)	90	16	8·3
Azimuth of sun's following limb from Fort Azimuth, at second observation ..	89	57	55

Mean of readings of vertical circle for zenith distances of the sun's limb, at	$19^h\ 49^m\ 39^s$	$19^h\ 50^m\ 45^s{\cdot}33$	0	0	9·5
	50 45				
	51 52				

* In the MS. this is called the N.L. The alteration made above seems to be supported by the agreement of the difference between the two observations, with the difference between the sun's diameter and the sun's motion in azimuth during the interval. The words following $41^s{\cdot}5$ are added by me.—G. B. A.

Mean of readings with circle reversed*	$19^{h}\ 53^{m}\ 44^{s}{\cdot}5$	$19^{h}\ 54^{m}\ 50^{s}{\cdot}17$	$148^{\circ}\ 2'\ 6''{\cdot}7$
	54 51		
	55 55		
Therefore the sun's apparent zenith distance at		19 52 47·75 =	74 0 58·6

Chronometer fast, $33^{s}{\cdot}03$.

And the azimuth of the signal rock on Fort Azimuth is 25° 52′ 16′ from the south point towards the east.

The sun cannot be seen from the station at sunrise, from the intervention of La Caille's Mount. At sunset I was always engaged with the sector; but the above determination is near enough for the purpose.

Lieutenant Williams and myself examined the relative heights of the base-line and corn-floor with an excellent 18-inch level, sent out by Capt. Beaufort for these inquiries. We found the north end 72·2 feet, and the south end 68·3 feet, lower than the corn-floor. The axis of the repeating circle was four feet above the floor. These quantities are taken into account in the computation of the altitudes, together with the refraction: the zenith distances having been observed at *both* ends of the base, the mean of the results was taken.

* Upon repeating the calculations, it appears that these observations were taken on the morning of Wednesday (April 25, civil reckoning), and that both the series of observations of zenith distance were made on the sun's upper limb.—G. B. A.

Heights, Distances, and Azimuths referred to the Repeating Circle* 21^{ft} 11^{in} *due East of the Axis of* BRADLEY'S *Sector, placed on the Ruin of* JACOBUS COTSEE'S *Dwelling-house,* 210 *feet on the Meridian South of* LA CAILLE'S *Granary:—*

	Height above the Floor.	Distance from the Repeating Circle.	Azimuth reckoned Eastward from the South Point.
	feet.	feet.	° ′ ″
Fort Azimuth	35·0	9902·2	25 52 16
Daniel Bernoulli	300·0	10271·0	36 44 26
West terminal rock of La Caille's Foot	10·0	324·5	60 49 56
Large remarkable rock of ditto	10·0	263·7	85 14 6
La Caille's south peak	781·0	4422·0	91 26 45
—— middle peak	679·0	2648·0	92 11 14
—— north peak	529·0	2484·0	97 45 0
Culminating point of Picquet Berg	1844·0	13533·0	102 44 19
La Caille's Foot, group of rocks	213·0	979·0	137 19 46
Ditto another group	204·0	748·0	143 24 14
Hunchback termination of Picquet Berg	681·0	5114·0	154 58 43
Valley between Hunchback and Castle Hill	....	....	180 0 0
Group of rocks above and close to the Klyp Fonteyn spring (largest rock)	....	1569·0	198 35 27
Castle Rock on Castle Hill	588·0	4060·0	217 2 51
Castle Hill flagstaff	878·0	8107·0	226 5 16
North end of base-line	—72·2	2603·0	281 8 30
South end of ditto	—68·3	2180·8	323 49 38

With the view of obtaining an estimate of the height of the sector-station above the level of the sea, I compared the readings of the barometer in the sector tent at 9^h 30^m P.M., with the corresponding readings at the Royal Observatory, as follow:—

* In preparing Plate VI. for the engraver, the lines have been drawn in conformity with the numbers in this table, and without regard to the numbers of the triangulation, which (in respect to some of the points of La Caille's Mount) are scarcely reconcilable with these.—G. B. A.

	Klyp Fonteyn.		Royal Observatory.	
	Barom.	Therm.	Barom.	Therm.
March 29	29·614	66°	30·058	59°·3
30	·661	65·7	·104	67·2
31	·564	68	·024	57·4
April 4	·605	59	·062	59·7
5	·681	60	·180	61
6	·662	61·8	30·152	62·5
7	·578	70·8	29·993	57·6
10	·624	70	30·080	62·5
11	·606	67·5	·030	59·5
15	·730	59·8	30·253	54
16	·466	62·9	29·985	56·6
18	·822	56·1	30·352	59
20	·630	61	·184	60·4
21	·480	64	·001	61·7
Means	29·623	63·8	30·104	59·9

The comparison of the barometers shewed that the indications of the portable one are less than the Observatory standard by $0^{in}{\cdot}090$. The neutral point of the former, $29^{in}{\cdot}4$; capacity, $\frac{1}{84}$; temperature, 54°. Applying these, and estimating the height of the Observatory standard at 35 feet above the level of the sea, the height of the sector above the same level is 396·4 feet, or, in round numbers, 400 feet.

Since writing the above, the height of the cistern of the standard barometer above the mean level of the sea, in Table Bay, has been found, by careful levelling, to be 37 feet.

THOS. MACLEAR.

September 30, 1838.

APPENDIX.

APPENDIX.

No. 1.

By the good offices of M. Hertzog, and of Mr. Moody, a gentleman engaged in examining the records of the Colonial Office, I have been enabled to collect the following documents identifying the place of Wales and Bailey's observations.

Extract from the Day-book "Colonial Office, Saturday, 31st October, 1772."

"The Astronomers, W. Wales and William Bailey (arrived with Captain Cook), allowed to erect an Observatory for their observations in the garden of the Burgher, Pieter Zeeman."

In the Transfer Office, the following records of transfers were found:—

"Jacob Van Dam transfers to Johannes Rogiers a house and land (in extent 1 morgan and 250 square rods) on 26th July, 1717.

"Maria Van Mullan, widow of Johannes Rogiers, transfers the same to Henricus Craywagen on 24th December, 1759.

"Henricus Craywagen transfers the same to Pieter Zeeman on 7th March, 1761.

"Catherine Verbeck, widow of Pieter Zeeman, transfers the same to Abraham a de Haan on 27th April, 1779.

"Abraham a de Haan transfers the same (by the name of Rosenberg or Concordia) to the Concordia Society, 1798."

Thus Pieter Zeeman's garden is the same with Concordia Gardens, the place to which I was guided by repeating Mr. Wales's triangles, starting from the front door of Mrs. De Witt's house in Strand Street.

No. 2.

Extract from the Resolutions of the Governor of the Cape of Good Hope, &c.
17 *February*, 1710.

"The Astronomer, PIETER COLBE, who arrived here in the year 1705, in the ship called the *Ulme*, from Europe; and who has for a considerable time been idling about, without attending to his astronomical observations or rendering any burgher-service:—it was thought advisable to demand from him whether he intends remaining here much longer, in which case he will in future be considered as a burgher, and thus become liable to taxes and doing burgher-duty; otherwise we shall give him his discharge, so that he may return to Europe."

This curious resolution has been extracted because of its connexion with the letter or memorial presented through the Marquis DE PUISIEULX, wherein the leave to reside at the Cape granted to COLBE is employed as an argument to procure a similar boon for LA CAILLE.

[It appears from the remark prefixed to LA CAILLE's Critical Notes on KOLBE's work (*Journal du Voyage au Cap*, edition 1763, page 317), that there existed other reasons for the inquietude of the Dutch colonial government with regard to the employments of Kolbe. His whole occupation, besides drinking and smoking, consisted in collecting the complaints of the Dutch settlers against the local government (which when sent by other channels had always been intercepted), and forwarding them to Europe. The effect of the publication of these after KOLBE's return to Europe was, that the central government recalled and punished nearly all the officers of the Cape government.—G. B. A.]

No. 3.

Mémoire sur le Projêt proposé par le Si. DE LA CAILLE, Astronome de l'Académie Royale des Sciences.

"Les savans qui ont eu jusq'ici un vrai zèle pour le progrès de l'astronomie, et par conséquent pour perfectionner la géographie et la navigation, ont reconnu, qu'il serait presqu' impossible de parvenir à quelque chose d'exact, principalement à l'égard de la partie qui a pour objet la détermination des longitudes sur mer par les observations de la lune, à moins que des observateurs les plus exercés et les mieux fournis de bons instrumens ne concertassent ensemble pour faire en même tems des observations du soleil et de la lune, dans les lieux de la terre les plus éloignés qu'il est possible dans le sens du méridien.

"C'est dans cette vue que depuis plus d'un siècle plusieurs astronomes célèbres ont entrepris de longs voyages; mais, malheureusement, celui qui étoit le plus important pour les longitudes à été celui qui a eu le moins de succès. En 1705, M. De Krosieck, Conseiller Privé du Roy de Prusse, envoye à ses frais M. Kolbe au Cap de Bonne Espérance, muni de plusieurs instrumens et d'une permission des états de Hollande, pour y faire toutes sortes d'observations astronomiques; sans doute, que le peu d'expérience de M. Kolbe pour les observations, et peut-être aussi l'imperfection de ses instrumens, ont été cause que l'astronomie ni la géographie n'ont tiré aucune utilité de ce voyage.

"Deux circonstances, extrêmement favorables pour obtenir un succès complet, se présentent dans le cours de l'année 1751; une opposition de *Mars* près de son périhélie, et une conjunction inférieure visible de *Vénus:* c'est pour profiter d'une occasion si rare que le Si. De La Caille, exercé depuis plus de treize années aux observations les plus délicates, et fourni de tous les instrumens les plus propres pour des recherches si desirées des astronomes, et si utiles à la navigation, demande qu'on luy procure les moyens de passer une année au Cap de Bonne Espérance, qui est à tous égards le seul lieu avantageusement situé, parcequ'il est le plus éloigné de Paris, et en même tems le plus proche du méridien qui passe par le milieu de l'Europe: deux conditions absolument essentielles, et sans lesquelles on ne peut espérer un succès raisonnable.

"Voyez, donc, les observations qui le Si. De La Caille se propose de faire pendant son séjour:—

"1. Il déterminera exactement la vraye position de ce fameux Cap, sur laquelle les plus célèbres géographes différent d'environ 100 lieues: et quoique Mrs. de la Compagnie des Indes, ayent chargé de ce soin M. D'Apres, capitaine de leurs vaisseaux, très capable de bien établir cette position, tant par son habilité dans les observations, que par les instrumens qu'ils luy ont fait faire exprès, cependant cet habile officier ne pourra y parvenir que par des méthodes indirectes et par conséquent peu susceptibles de précision, parceque les éclipses des satellites de *Jupiter* ne pourront être visibles pendant le tems de relâche que les affaires de la Compagnie luy permettront de prendre.

"2. Il déterminera par des observations concertées, la parallaxe de la lune, élément le plus important, et le moins connu de la théorie de cet astre. Tous les astronomes conviennent que c'est là la seule manière de l'établir avec toute la précision que l'on peut désirer.

"3. Il observera la parallaxe du soleil, élément encore plus incertain à proportion que n'est la parallaxe de la lune: les deux phénomènes rares dont il a été parlé cy-dessus, en fourniront plusieurs moyens également surs.

"4. Il complettera le catalogue des principales étoiles fixes, par la même méthode, et avec les mêmes instrumens avec lesquels il a déjà établi les positions exactes des étoiles boréales: celles du zodiac qui sont australes ne peuvent être déterminées que

très imparfaitement dans l'Europe, à cause qu'elles se levent trop peu et trop lentement sur l'horison : c'est pour cette raison qu'on a été obligé jusqu'icy d'éviter de comparer la lune à ces étoiles, parce-que les observations étoient trop incertaines.

" A l'égard de l'exécution de ce projet les moyens en sont extrêmement simples.

" Il n'y a aucune dépense à faire pour la construction des instrumens; elle consiste toute dans la traversée et dans la nourriture du Si. De La Caille seul, pendant environ une année. Il n'a besoin d'aucun aide, d'aucun domestique ; il restera en pension dans le lieu que l'on luy indiquera; la nature de ses observations n'exige qu'un séjour tranquille dans un même lieu, et tout lieu sera propre pour y établir ses instrumens. Les Hollandois, qui ont accordé à Mr. Krosieck la permission d'entretenir au Cap un Astronome Prussien, destine à exécuter précisément le même projet dont il s'agit icy, ne peuvent raisonnablement la refuser au Roy pour un Astronome de son Académie, qui se tiendra exactement dans le lieu qu'on luy assignera, soit dans le fort, soit dans l'intérieur des terres : ce projet regardant d'ailleurs le bien commun de toutes les nations."

[Here the memorial terminates abruptly without signature.]

No. 4.

Extract from Journal of the States-General.

" *25th August*, 1750.

" Received a letter from Mr. Lestevenon van Berkenrode, their H. M. Ambassador at the Court of France, dated at Paris, the 20th of this current month, intimating that, being at Versailles, the Marquis de Puisieulx had handed to him the memorial annexed to the said letter; and added, that he felt persuaded that their H. M. would permit M. De La Caille to proceed to the Cape of Good Hope, for the purpose of prosecuting his Astronomical Observations there, as detailed in the said memorial, since M. De Krosieck, Privy Councillor of the King of Prussia, had obtained a similar permission from their H. M. in the year 1705.

" Which having been deliberated on, it was thought proper and resolved that a copy of the said letter and annexure be sent to the Representatives of their H. M. and the Directors of the Dutch East India Company, at their Presidial Chambers at Amsterdam, in order to obtain their advice on the matter.

" N. S. VANDERVELDE."

No. 5.

Extract from Journal of the States-General.

23d November, 1750.

"Received a letter from the Representatives of his Highness and the Directors of the Dutch United East India Company, giving cover to a Resolution of the Chamber of XVII. adopted at a meeting held in Amsterdam on the 20th instant, in compliance with a Resolution of their H. M. of the 25th August last, and requesting advice on a Memorial handed by the Marquis de PUISIEULX to Mr. LESTEVENON VAN BERKENRODE, their H. M. Ambassador at the Court of France, praying that their H. M. may be pleased to permit Mr. DE LA CAILLE to proceed to the Cape of Good Hope, in order effectually to prosecute his astronomical observations there, as more fully detailed in the said Memorial.

"After deliberation on the subject, it was thought proper and resolved to permit Mr. DE LA CAILLE, as he is permitted by these presents, to proceed to the Cape of Good Hope for the purpose set forth in the said Memorial.

"Extract of this Resolution of their H. M. to be sent to the said Representatives and Directors in the Chamber of XVII. at Amsterdam aforesaid, in order that the same may be communicated to the Government of the Cape of Good Hope, and cause them to take such precautions as to prevent any improper use being made of this permission; and a like extract also to Mr. LESTEVENON VAN BERKENRODE, for his information and guidance.

"P. VERSEHOOR, *Pt.*
"H. FOGEL.
"J. SWEERS."

No. 6.

Letter from the Representatives of the Prince of ORANGE and the Directors of the Dutch East India Company to the Authorities of the Cape Colony.

To the Councillor Extraordinary and the Expected Governor of the Cape of Good Hope.

MUCH RESPECTED SIR,

After the separation of the last Annual Meeting of Council [of XVII.], we received their High Mightinesses' Resolution of the 23d instant, which, together

with the Memorial of the Marquis de Puisieulx, therein alluded to, we herewith transmit to you accordingly: and remain,

Your good friends,
The Representatives of His Highness,
And the Directors of the E. I. Company of Amsterdam, and out of the same,
PHILIP VAN DER GHIESSEN,
JOSUA VAN DER POORTEN,
J. WALTERS,
JACOB ALEWYN,
J. BORN VAN WAVEREN,
GROOFLAND JANSON.

Amsterdam, 27th Nov. 1750.

No. 7.

Extract from Letter from the Representatives and Directors, &c. to the Governor of the Cape Colony.

"The Presidial Chamber, in a letter of the 27th Nov. 1750, after the separation of the Annual Meeting, having forwarded to you their H. M. Resolution of the 23d, together with a Memorial of the Marquis de Puisieulx, on the subject of Mr. De La Caille's departure to, and sojourn at, the Cape, for the purpose of prosecuting his Astronomical Observations, we, agreeing thereto, do hereby accordingly direct you to comply with the directions contained in the said Resolution.

"P. VAN GHIESSEN,
"J. VAN DER POORTEN,
&c. &c."

No. 8.

Letter from the Prince of Orange to the Governor of the Cape of Good Hope.

To the Governor of the Cape of Good Hope.

Sir,

Mr. De La Caille, Member of the Royal Academy of Sciences at Paris, who intends to proceed to, and remain at, the Cape for some time, with the

view of pursuing his Astronomical Observations, having applied to their High Mightinesses for the necessary permission to that effect,—and we being also disposed to comply with the request made to us in that respect by this gentleman, do therefore hereby recommend him to you, trusting that you will render him such assistance as he may stand in need of during his temporary residence there.

Recommending you in God's holy protection and keeping,

We remain, sir,

Your well-disposed friend,

(Signed) PRINCE D'ORANGE AND NASSAU.

By order of His Highness,

In the absence of the Private Secretary,

(Signed) J. D. HORST.

On the Loo,
17th October, 1750.

No. 9.

Letter from the Governor of the Cape to the Prince of ORANGE.

To His Highness the Prince of ORANGE *and* NASSAU.

MOST ILLUSTRIOUS PRINCE AND SIR,

Mr. DE LA CAILLE, who arrived here on the 19th of this present month of April, having handed over to me your Highness's letter, dated on the Loo, the 17th October last, I have, in dutiful compliance with the desire therein expressed, not only permitted that gentleman to remain at this place for some time for the purpose of proceeding with his Astronomical Observations, but I shall also not fail to render him such assistance as may be in my power towards bringing that work to a desirable conclusion; of which, I humbly trust, your Highness is fully convinced, as also that I shall ever consider it as the greatest happiness in having an opportunity of subscribing myself, with sentiments of profound respect and esteem,

Most illustrious Prince and Sir,

Your Highness's most faithful, most obedient, and most humble servant,

(Signed) R. TULBAGH.

In the Castle of Good Hope,
the 21st April, 1751.

No. 10.

Extract from the Journal kept at the Office of the Secretary of the Government at the Cape of Good Hope.

"*Monday*, 19*th April*, 1751.

"Arrived, the French ship Le Glorieux, carrying 14 guns and 115 men, which left Port l'Orient on the 21st November last year, under the command of Captain D'Apres de Mannevillette, bound to the Island Mauritius, having on board Mr. De La Caille, Member of the Royal Academy of Sciences at Paris, who will remain here for some time, with the view of making Astronomical Observations; he having for that purpose applied to and obtained the requisite permission from their High Mightinesses, as is expressed in a letter from His Most Illustrious Highness the Prince of Orange and Nassau to His Excellency the Governor, of which Mr. De La Caille himself was the bearer."

No. 11.

Envelope enclosing Letters to La Caille.

To the Governor and Council at the Cape.

It has pleased His Serene Highness the Prince of Orange and Nassau, &c., to send us two Letters addressed to Mr. De La Caille, Member of the Academy of Sciences at Paris, who is at present at the Cape of Good Hope, in order that we should send them to him by the first opportunity: we have, therefore, considered it expedient to forward the said two Letters to you, for the purpose of handing them to Mr. De La Caille. Recommending you to the protection of God, we remain,

Your good friends,

THE REPRESENTATIVES,

Amsterdam, 16*th Sept.* 1751. &c. &c.

No. 12.

Letter from Mr. MULLER (Officer of Engineers accompanying LA CAILLE) to the Governor of the Cape of Good Hope.

SIR,

Mr. DE LA CAILLE not having as yet completed his Astronomical Observations, partly owing to a neglect of keeping a fire kindled at Piquetberg, and partly from the cloudy state of the weather, wherefore we have to await a clear sky, so that we may commence the measurement of the base-line; and as Mr. DE LA CAILLE'S application to you is only to obtain assistance in the matter before stated, I therefore beg you will be pleased to grant me a few days' more leave, in order that I may be enabled to fulfil your orders in the measurement of the base-line.

And as the time of the yearly muster is approaching, I beg you will be pleased to order the officer of the mainguard to assist with the artillerymen. By doing which, you will much oblige him who has the honour, with all due respect, to subscribe himself,

Your most obedient humble servant,

Africa, 11th October, 1752. E. B. MULLER.

Favoured by M. BESTBIER.

No. 13.

Extract from the Journal kept in the Office of the Secretary to the Government of the Cape of Good Hope.

" *Thursday, 23d September, 1751.*

"Mr. ABBÉ DE LA CAILLE, who is still at this place pursuing his Astronomical Observations, having recently taken the height of Table and Wind Mountains, and of the Lion's Head and Rump, went yesterday, in order to effect the measurement with more accuracy, to the top of Table Mountain, and found the heights of the said mountains to be as follows: —

"The height of	Lion's Rump	1102	Parisian feet.
——	Lion's Head	2085	
——	west corner of Table Mountain	3353	
——	east ——	3302	
——	Windberg	3106	

all calculated from the level of the sea; the length of Table Mountain, east and west, being 8346 Parisian feet."

No. 14.

Extract from the Journal kept in the Office of the Secretary to the Government of the Cape of Good Hope.

" *Thursday, 8th March*, 1753.

" This afternoon the French ship Le Puisieux, after having saluted and received a contra salute, proceeded on her voyage to the Mauritius, having on board Mr. De La Caille, who had completed his Astronomical Observations at this place."

No. 15.

After the foregoing memoir was sent to England, I learned, by accident, that Klyp Fonteyn was formerly included in the Clan William district. The records in the Treasurer-General's Office were therefore examined, wherein was discovered the original permission granted to Cornelis Coetsee to *locate* at Klyp Fonteyn, dated 31st August, 1744. Likewise the *notice to quit* of Jan de Lang (who, it appears, married the widow of Cornelis Coetsee) dated 15th September, 1758.

These dates include the epoch of La Caille's visit. Jacobus Coetsee, Jerrit's father, took up his residence in 1762.

The following translations of these documents from the Dutch language are by a sworn translator. The original copies are signed by the Treasurer-General, W. H. Harvey, Esq.

" *Fo.* 22. " *Stellenbosch.*

" It is hereby permitted to the agriculturist, Cornelis Coetsee, for a period of " one whole year, to resort to, and graze his cattle at, the Klip Fontein, at the corner " of Picquet Berg (being the abandoned place of Jan Pieterz), and for which he has " already paid—agreeably to the Resolution of Council, dated 24th January, 1741— " two good and serviceable oxen, of four years old, as tribute to the Hon. Company; " remaining, moreover, obliged, after this shall have been registered in the Secretary's " Office, to pay into the Company's treasury a fine of twelve rix dollars, and to renew " this permission within one month after its expiration; in default of which he shall " incur such fines as are prescribed in the several proclamations on that head. He

"being, moreover, bound to deliver at the Castle, for the Government or the Company, "the tithe, or one tenth part of the whole he may raise on the land in question. This "permission to be previously produced to the landrost.

"In the Castle of Good Hope, 31st August, 1744.

(Signed)	"H. SWELLENGREBEL,
"Received,	W. V. KERKHOFF,
"Entered by me,	ER. SCHOOR."

"On this, the 15th Sept. 1758, the soldier, JAN DE LANG (as having a verbal order "to that effect from his wife, the widow of the late agriculturist, CORNELIS COETSEE), "gives notice that, with the knowledge of His Excellency the Governor, he leaves the "aforesaid cattle post, after having duly paid nine serviceable oxen as a tribute for "three years, instead of the ordinary taxes, and in reduction of thirteen years' arrears, "which he has delivered at the Company's post De Schuur, as per Receipt of the "Overseer, JAN HENDRICK HOFMEYER, dated 14th September of this year,—being "held bound, from time to time, to pay up the remaining ten years' dues.

(Signed) "H. ROUNENKAMP, Chief Clerk.

A true translation,
(Signed) B. J. VAN DE SANDT.

The next paragraph in the record of this land is the grant of it to JACOBUS COETSEE, the father of JERRIT, so often mentioned, dated 1758.

Thus we see that the real proprietor of the place in 1752 was CORNELIS COETSEE; that LETCHIE SCHALKWYK's father was not a proprietor, but a householder at the will of COETSEE. JERRIT COETSEE's general testimony is supported, and we have no reason to doubt his recollection of his father's residence, which was his own residence in his youth. There is scarcely a shadow of doubt remaining, therefore, that the foundation exposed by us (page 16, line 8) is that of the granary wherein LA CAILLE made his sector-observations.

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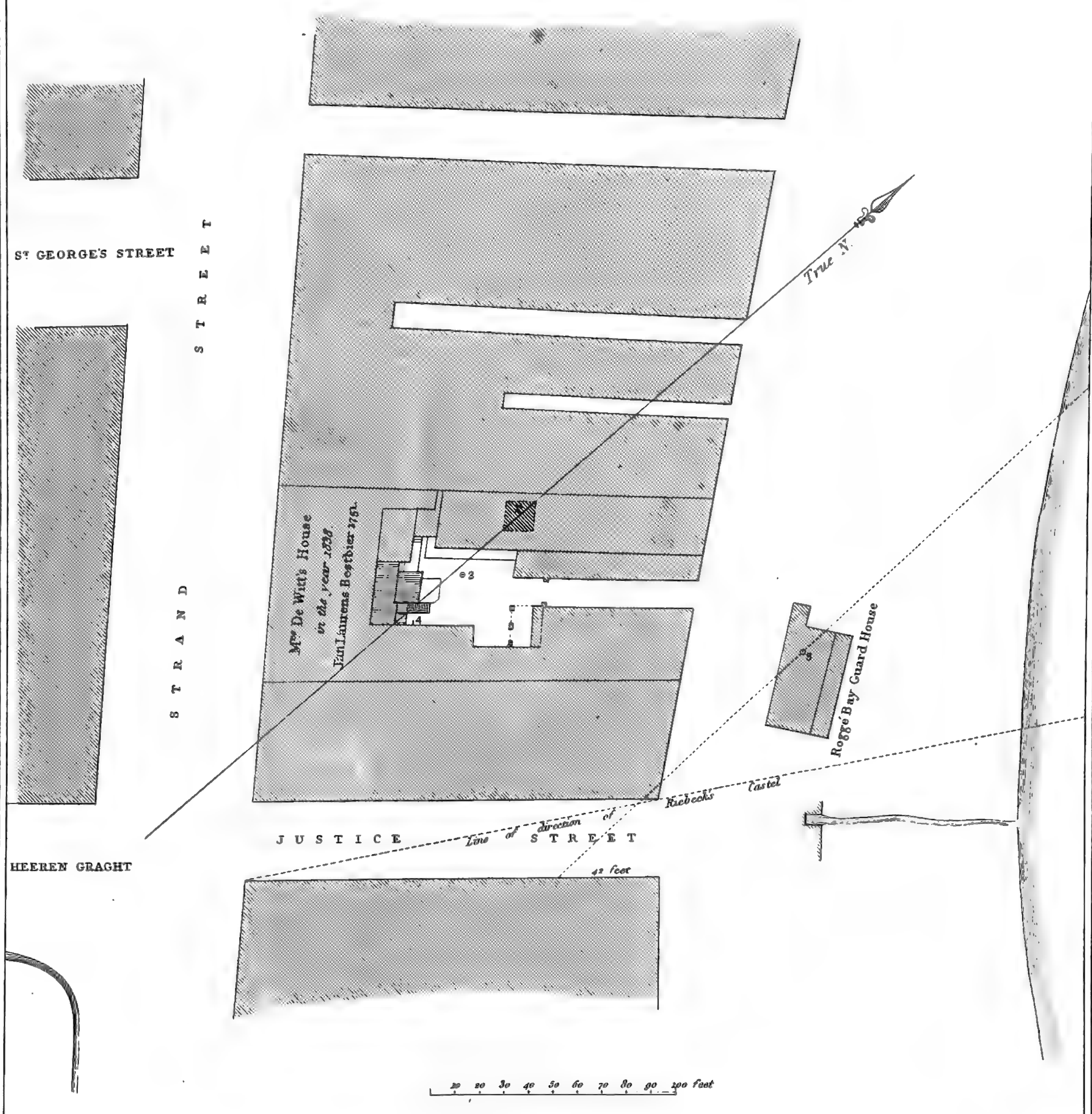
LEICESTER SQUARE.

Verification and Extension of La Caille's Arc of Meridian.

Plate I.

Plan of the Probable Position of La Caille's Observatory and Zenith Sector in 1751 & 2. Also the Relative Position of Bradley's Zenith Sector in 1838.



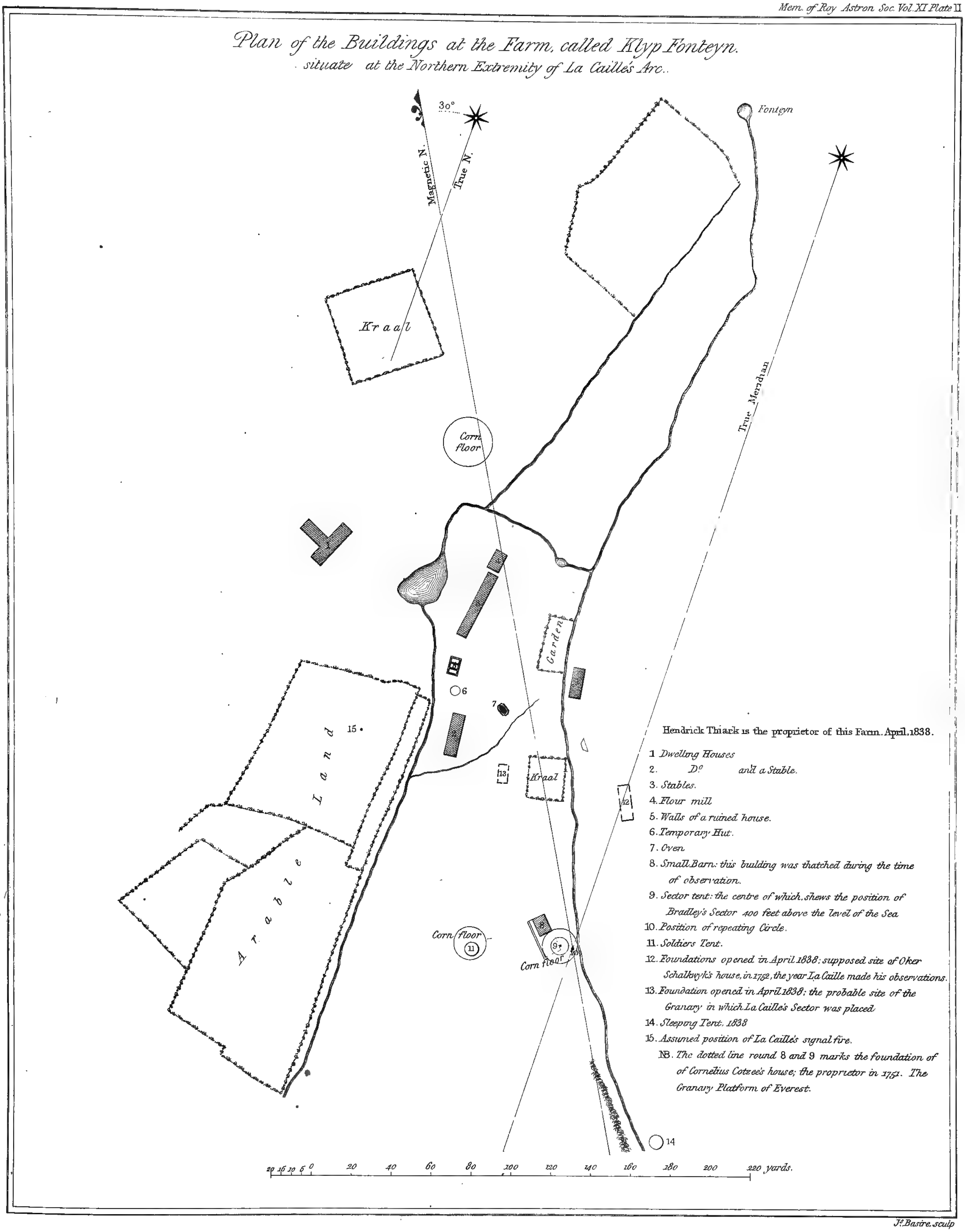
REFERENCES.

1. *Probable position of La Caille's Sector.*
2. *Position of Bradley's Sector, in Mrs De Witt's Yard, in February 1838.*
3. ......*Do*.................. *Do*........ *in Roggé Bay Guard House, in May and June 1838.*
4. *Position of Dial Pin, projecting from the Wall; supposed to have been placed there by La Caille.*

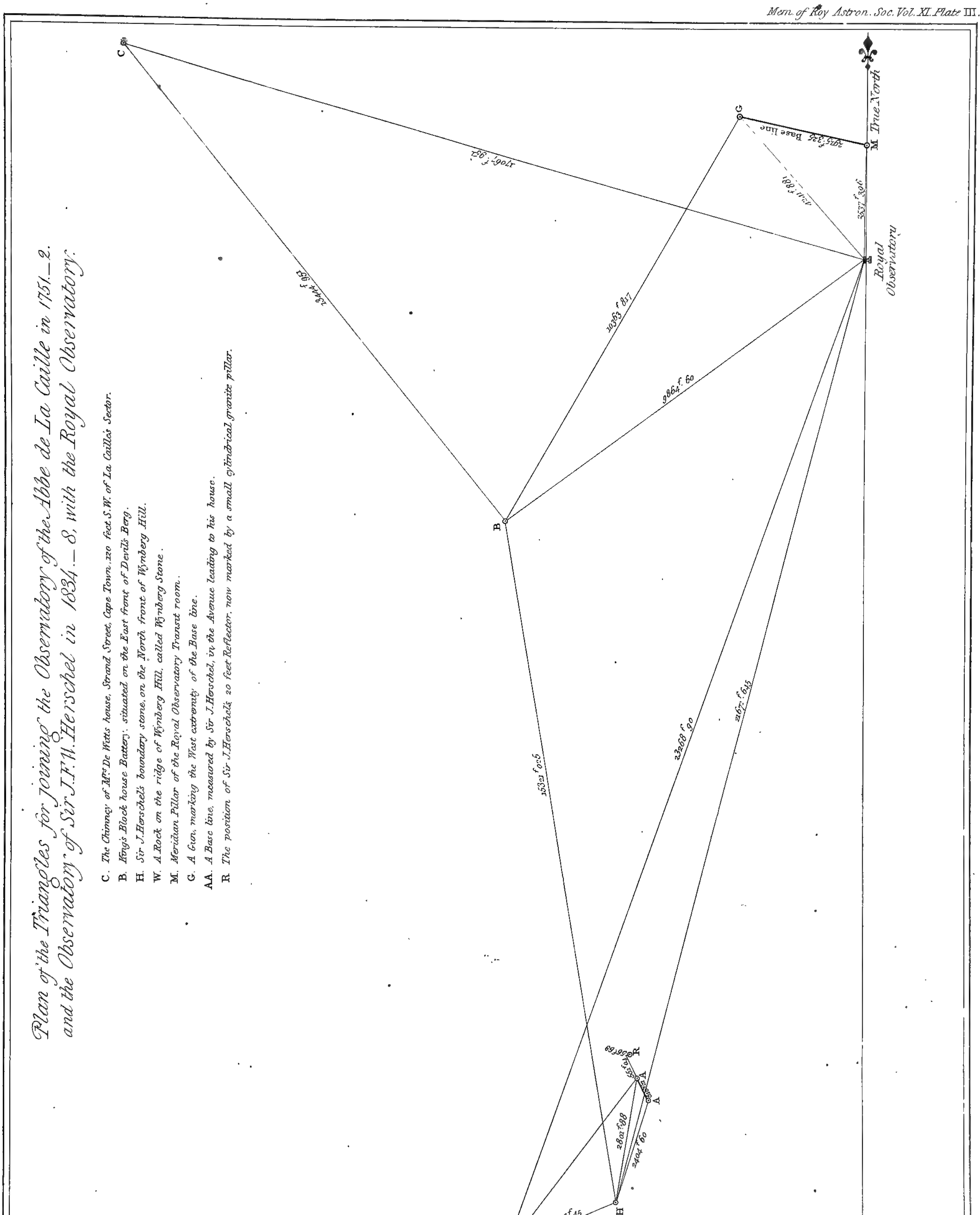
J. Basire sculp.

Verification and Extension of La Caille's Arc of Meridian.

Mem. of Roy. Astron. Soc. Vol. XI Plate II

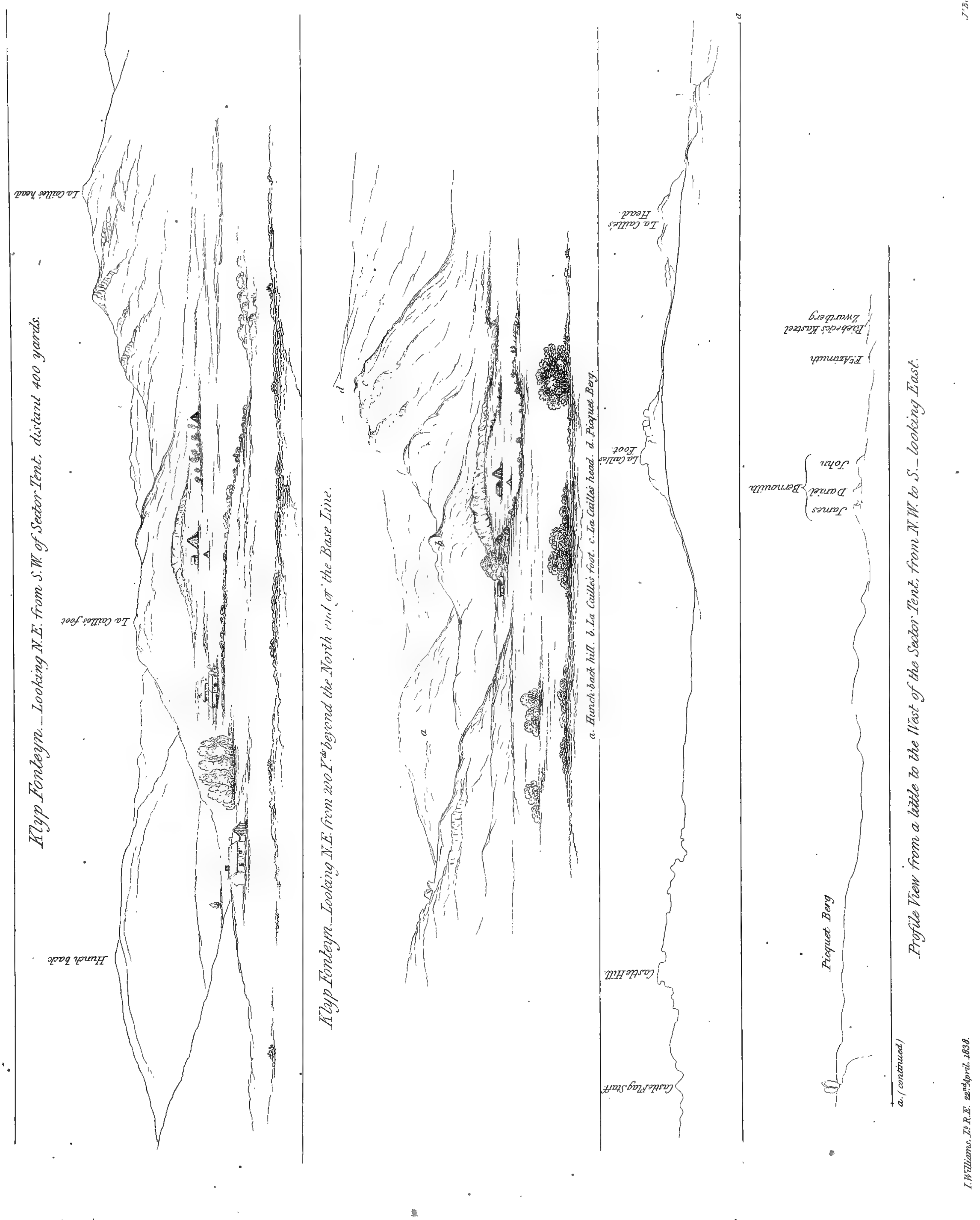


J. Basire, sculp



J^s Basire sculp.

Views of the Mountains &c. in the neighbourhood of Klyp Fonteyn.



Klyp Fonteyn._Looking N.E. from S.W. of Sector Tent, distant 400 yards.

Klyp Fonteyn._Looking N.E. from 200 Yds beyond the North end of the Base Line.

a. Hunch back hill. b. La Caille's foot. c. La Caille's head. d. Piquet Berg.

Profile View from a little to the West of the Sector Tent, from N.W. to S._looking East.

Plate V

Plan of the Mountains &c. in the neighbourhood of Klip Fontein and of the position of Bradley's Sector, April 1838

Verification and Extension of La Caille's Arc of Meridian.

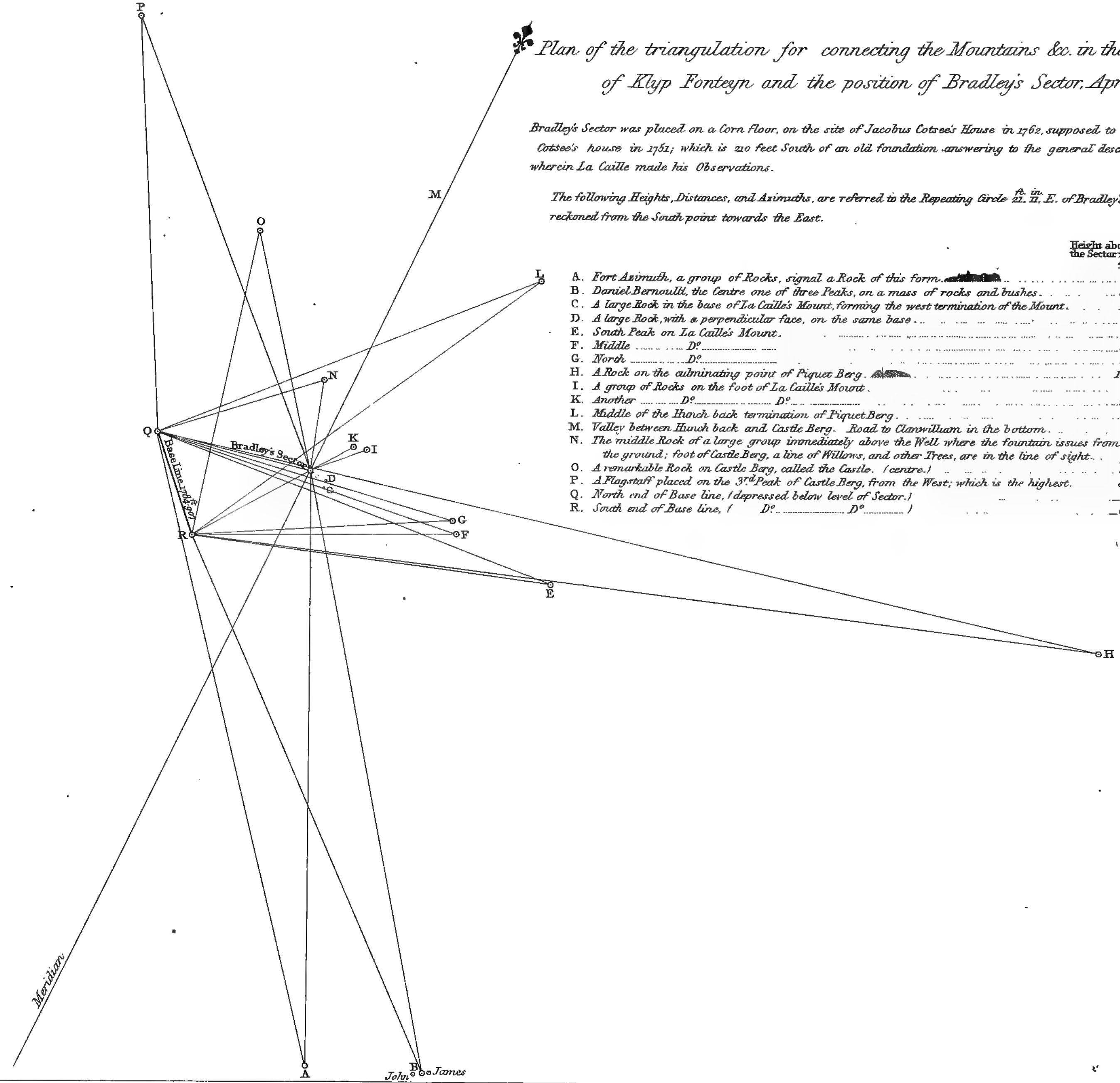
Mem of Roy. Astron. Soc Vol. XI Plate VI.

Plan of the triangulation for connecting the Mountains &c. in the neighbourhood of Klyp Fonteyn and the position of Bradley's Sector, April, 1838.

Bradley's Sector was placed on a Corn floor, on the site of Jacobus Cotsee's House in 1762, supposed to be the same with Cornelius Cotsee's house in 1751; which is 210 feet South of an old foundation answering to the general description of the Granary wherein La Caille made his Observations.

The following Heights, Distances, and Azimuths, are referred to the Repeating Circle 21 ft. 11 in. E. of Bradley's Sector. The Azimuths are reckoned from the South point towards the East.

	Height above the Sector floor.	Dist.s from the Circle.	Azimuths as seen from the Circle.
	feet	feet	° ′ ″
A. Fort Azimuth, a group of Rocks, signal a Rock of this form.	35·	9902·2	25·52 16
B. Daniel Bernoulli, the Centre one of three Peaks, on a mass of rocks and bushes	300·	10211·1	36·44·26
C. A large Rock in the base of La Caille's Mount, forming the west termination of the Mount.	10·	324·5	60·49·56
D. A large Rock, with a perpendicular face, on the same base	10·	263·7	85·14 6
E. South Peak on La Caille's Mount.	781	4422·	91 26·45
F. Middle D.o	679·	2648·	92 11·14
G. North D.o	529·	2484	97 45 0
H. A Rock on the culminating point of Piquet Berg.	1844	13533·	102·44·19
I. A group of Rocks on the foot of La Caille's Mount.	213	979·	137 19·46
K. Another D.o D.o	204	748	143·24 14
L. Middle of the Hunch back termination of Piquet Berg.	681·	5114·	154·58·43
M. Valley between Hunch back and Castle Berg. Road to Clanwilliam in the bottom.			180 0· 0
N. The middle Rock of a large group immediately above the Well where the fountain issues from the ground; foot of Castle Berg, a line of Willows, and other Trees, are in the line of sight.		1569·	198 35 27
O. A remarkable Rock on Castle Berg, called the Castle. (centre.)	588·	4060	217·2·51
P. A Flagstaff placed on the 3.rd Peak of Castle Berg, from the West; which is the highest.	878	8107	226·5 16
Q. North end of Base line, (depressed below level of Sector.)	—72·2	2603	281 8 30
R. South end of Base line, (D.o D.o)	—68 3	2180·8	323·49 38



J.s Basire sculp.

OPERATIONS

FOR

THE VERIFICATION AND EXTENSION

OF

THE ABBÉ DE LA CAILLE'S ARC OF MERIDIAN,

AT

THE CAPE OF GOOD HOPE.

PART II.

VERIFICATION OF THE ASTRONOMICAL AMPLITUDE OF LA CAILLE'S ARC.

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§ 7. DESCRIPTION OF BRADLEY'S SECTOR, WITH WHICH THE ASTRONOMICAL OBSERVATIONS OF MR. MACLEAR WERE MADE.*

OF BRADLEY'S sector, an instrument not more remarkable for its historical interest than for the general excellence of its construction, no sufficient account exists. BRADLEY himself, in the *Phil. Trans.* Vol. XLV. (1748), p. 7, has referred generally to the description of the sector used by the French astronomers for the degrees of meridian in Lapland and in France (see the *Dégré du Méridien entre Paris et Amiens*). It will be found, however, on comparing the plates of the French work with those shortly to be explained, that some important parts in the construction of BRADLEY'S sector are omitted in the description of that used by the French astronomers. A general view

* The whole of this section is written by me.—G. B. A.

of the sector, as mounted at Greenwich, is given in BRADLEY'S *Miscellaneous Works*, edited by Professor RIGAUD; but the details of construction are there necessarily omitted.

When the Lords Commissioners of the Admiralty, on my recommendation, had determined to send this instrument to the Cape of Good Hope, I thought it desirable to preserve drawings of it in such detail as might (if it were desired) enable a modern artist to construct an exact copy of the instrument in the event of its loss or injury on its voyage. A draughtsman, Mr. B. SLY, was accordingly employed to make drawings under my direction. The instrument was taken to pieces, and some parts were separated which probably had never been unscrewed since the sector left the hands of its maker.

Before describing the sector in the state in which it was sent to the Cape of Good Hope, it will be proper to premise an account of the alterations which were made to adapt it to this service.

The instrument, when at Greenwich, was suspended to a bracket fixed to the wall of the Quadrant Room; and there was no means of reversing it in azimuth, except by taking it down from that bracket and carrying it to another bracket on the opposite wall of the same room: an operation which, as I am informed by Mr. HENRY (the only assistant now at the Royal Observatory who remembers its use), occupied a whole morning. When the instrument was prepared for use at different field-stations at the Cape of Good Hope, a new cast-iron bracket of smaller size was made, and was attached to a vertical spindle turning in azimuth within a large tripod-stand; upon this bracket the brass work was mounted in exactly the same manner as upon the original brackets. To the lower part of the spindle an iron bar was screwed, for attaching the ends of the brass frame that carries the weight-pulleys and steadies the plumb-line shade (which frame was formerly attached to the wall); and also another iron bar, for supporting the back arch by means of two flat horizontal pieces, with long screw-holes, that project backwards from the back arch. A wooden sliding arc of a circle, carrying a flat board for a lamp-stand, was placed on the spindle opposite to the illuminator of the telescope. A four-glass diagonal eyepiece was made: the original eye-glass being a single lens. These are all the changes made under my direction.

The object-glass, whose convex lens is thin, was found so much pinched

in its cell that the coloured rings were exceedingly distorted. It was relieved. The image of a star, as now shewn by the telescope, is extremely neat.

The whole of this work was done by Mr. SIMMS in the summer of 1837.

DESCRIPTION OF THE PLATES.

Fig. 1, *Plate* VII. Side view of the top of the great spindle, the top of the cast-iron bracket, and the brass work which it carries (the lower part of the great spindle and of the bracket being cut off).

On the side of the bracket are seen two screw-heads; these screws, and two similar ones inserted the opposite way in the opposite cheek of the bracket, are for supporting *fixedly* an iron-piece of the shape $\sqcap$ partly seen in fig. 2. This iron is part of the original work. Its middle side is next to the spindle, but distant at least two inches from the spindle. This iron-piece supports *movably* a brass plate, shaped like an imperfect horse-shoe, whose edge is seen in fig. 1. The motion of this brass plate is circular in azimuth; it is effected by the opposite tangent screws seen in figs. 1 and 2; it is limited to circularity of motion by three small screws passing through elongated holes in the brass and screwed in the iron: they are seen well in fig. 2. This brass plate supports *movably* another brass plate of a complete horse-shoe form, whose edge is seen in fig. 1, and whose flat is entirely seen in fig. 2. The motion of this upper brass plate is rectilinear, viz. to and from the spindle; it is effected by a screw (whose large milled head is seen in figs. 1 and 2), which works in a cock of the lower brass plate with shoulder and pinned collar; and in the upper brass plate by the thread of its screw. The motion is limited to rectilinear direction by three pins carried by the lower brass plate which enter elongated holes in the upper: these are not visible in fig. 1, but may be seen in fig. 2, where the two that are farthest from the spindle are partially concealed by the edge of a small plate above the upper brass piece. This small plate, whose end is seen in fig. 1, is merely for attachment of the upper end of the plumb-line shade. There are also seen sideways in fig. 1 the heads of two screws with washers, which pass through or into the upper plate: I do not at all recollect their use, but suppose that it may be to hold the upper brass plate down to the lower brass plate.

Fig. 2. This contains an end view (from the top) of the great spindle, shewing its back edge bar, which, at the middle of the spindle's length, is deep. An iron ring is fixed near the top to give hold for raising it. At the top of the spindle is seen the plate (of brass or of iron) with deep conical hole, in which the conical point of the fixed pivot of the tripod-stand enters. All the rest of the work has been described in the account of fig. 1. The elongated holes of the lower brass plate are seen here through larger holes of the upper brass plate, which are made for convenience of access to the screws. There are also three other sets of screw-holes, which seem to have been intended for some other place of mounting.

Figs. 3, 4, 5, *Plate* VIII., are a perspective view, a plan, and a front view, of the triangular frame which stands upon the upper brass plate of figs. 1 and 2, and supports the pivots of the telescope. The triangular frame stands on the points of three screws: small holes for two of them (the two front screws) are made in the upper brass plate, and may be seen in fig. 2. In figs. 3, 4, and 5, the following parts may be seen: the back Y (or that nearest to the spindle) with a semicylindrical cover: the front Y without a cover: the piece shaped thus $\sqcap$, which carries the plumb-line adjustment; this piece is movable by hand to and from the spindle in a dovetail groove, but there is no screw motion: the plumb-line adjustment carried by the last. The suspending piece is moved upon the piece of the form $\sqcap$ by a screw (with pinned collar, I suppose, but it is not so represented), whose point abuts on the point of another screw for adjustment to steadiness; the thread of the screw works in the suspending piece; the plumb-wire passes over two notches on the suspending piece, and its end is pinched by the shoulder of a small screw in the suspending piece. The dovetail groove below the front of the triangular frame is for the sliding piece which carries the microscope for viewing the wire and pivot dot. Fig. 4 shews also the microscope in position, sliding in a split tube, which is carried by a stalk that turns in a small split tube carried by the dovetail slider.

The front of the triangular piece, as shewn in fig. 5, bears the appearance of having been cut in two places, or having been formed by inserting a front piece which has no connexion with the sides except by means of two subsidiary corner pieces: this appearance is represented quite correctly. I can give no further account of it.

Fig. 6, *Plate* IX., shews the upper end, or object-glass end, of the telescope. The object-glass cell is screwed upon a brass tube, which is thrust into the telescope tube, and is held there by friction only. The upper collar of the telescope tube is of brass, but the rest of the telescope tube is of tin-plate. The upper collar carries the two pivots; the back pivot is plain; the front pivot has, screwed upon its end with three screws, a smaller pivot, on the centre of which is a gold pin, in which is the fine dot over which the plumb-line is made to pass. This dot is so excentric that it is absolutely necessary to adjust the plumb-line for every observation. Fig. 6 shews also the lower end with the six screw-holes for the screws by which the eyepiece is attached: the milled edge at the bottom is a part of the tube.

Fig. 7 shews again the upper pivot: it also shews the illuminator. This is a small piece of speculum-metal carried by a stalk which is thrust in at one side of the tube: the metal is cut at an angle of 45°. On the opposite side of the tube is a hole with a glass cover for the light to shine in at.

Fig. 8, *Plate* X., is a perspective view of the sector-arc and the eyepiece-plate to which it is fixedly attached. Farthest from the eye is the milled head of a screw for moving the roller-frame; it turns in a cock, being held by a shoulder and pinned collar. On the upper ring are seen six screws, which are for attaching the eyepiece-plate to the telescope-tube (see the bottom of fig. 6). This upper ring is thrust into the bottom of the telescope-tube, and the screws pass through the holes of the tube, and their threads lay hold of the upper ring. Below the lowest ring are seen the heads of two flat-headed screws, which hold the eyepiece-cell, with play for motion in azimuth. At the right hand of the stout ring is seen the small mirror or plate of very hard steel (the hardest, Mr. Simms says, that he ever touched). The face of this mirror is pressed, in observation, by the point of the micrometer-screw. Below this may be seen a very small portion of another similar mirror of brass (nearly hidden in the figure by the sector-arc); it is to receive the action of the guarding-screw, that the steel mirror may not be in perpetual contact with the micrometer-screw when observation is not going on. The steel mirror, when not in use, was formerly covered by a brass or copper cap: it is now covered by a zinc cap. In front is the sector-arc (in a vertical plane), behind which may be indistinctly seen its back-edge-piece,

connected with it by knee-pieces. The two stoutest knee-pieces are those at the corner of the square plate, by which the connexion of the eyepiece-plate and the sector-arc is made. Below the five-minute divisions of the sector-arc are the gold pins, on which nice round points are made for bisection with the plumb-line. The sector-arc is of steel; the rest of the work is of brass.

Fig. 9, *Plate* XI., is a plan of the same, as seen from the upper side. The screw with shoulder and pinned collar is seen well (its thread works in part of the roller-frame not seen here). The use of the square holes at the corners (which are omitted in fig. 8, but shewn in figs. 9 and 10) I forget; but as they correspond in position with the pivots of the two rollers of the roller-frame, they are probably made for access to them. Near the left-hand upper corner in fig. 9, and near the right-hand upper corner in fig. 10, is a small circle: this ought to have been represented as a *hole,* into which enters the pin (secured by a screw) in which works the thread of the screw that gives azimuth motion to the eyepiece. The explanation of other parts may be taken from fig. 8.

Fig. 10 is a plan of the same, as seen from the lower side. Besides the parts shewn in the other, there are two long rectangular holes at the two sides (omitted in figs. 8 and 9) for the pins which limit the motion of the roller-frame to rectilinearity. There are also seen *raised* the flat heads of the four screws which allow azimuthal motion to the eyepiece. The other screws I believe are for holding fixedly the stout ring and other parts.

Fig. 11 is a view of the same endways in regard to the arc. At the left is the arc, fore-shortened. In the centre are the two mirrors, the steel one above and the brass one below. Under the arc's back-edge, but above the eyepiece-plate, is a thicker piece, by which (I believe) the arc and the eyepiece-plate are connected.

Fig. 12, *Plate* XII., is an elevation of the eyepiece-cell. To the left is the thick pin described in the end of the account of fig. 9: it enters the circular hole in figs. 9 and 10, and is secured by a washer with square hole and a flat-headed screw. The thread of the tangent-screw which gives azimuthal motion to the eyepiece-cell works in this thick pin. The other end of the screw works with shoulder and pinned collar in another thick pin that turns

in the flat of the eyepiece-cell. It has a square end, for a common key, not represented here. Near the bottom of fig. 12 is seen a hole in the side of the cell: I think that it must have been for observation with a diagonal mirror, but I have not found any which fit to the cell.

Fig. 13 is a perspective view of the same cell, with the new diagonal eyepiece. The tangent-screw is partly concealed, but the four elongated holes of the flat are well seen; these are for the four screws partly seen in fig. 8, but better seen in fig. 10, and seen in profile in fig. 11. Within the eyepiece-tube is seen the frame carrying the cross-wires: I believe that it is merely thrust in, but I did not dislodge it.

Fig. 14, *Plate* XIII., is a perspective view of the roller-frame. Under each of the two sides are seen the double square pins, with a screw and long spring, which slide in the long rectangular holes (described under fig. 10). At two corners are seen the two rollers which run along the front-edge of the back-arch. To the side between these two rollers is attached the great curved spring, carrying at its point a third roller, which runs along the back-edge of the back-arch. At the bottom of the great spring is a hole, through which passes the screw (freely) that is mentioned at the beginning of the description of figs. 8 and 9. The thread of that screw works in the small piece which, in fig. 14, is nearer to the eye.

Fig. 15 is a perspective view of the eyepiece-plate and sector-arc (broken off at the end) carrying the eyepiece-cell, the diagonal eyepiece, and the roller-frame, exactly in the state in which they are attached for observation to the telescope tube.

Fig. 16, *Plate* XIV., is a perspective view of the slider, which slides upon the back-arch, and is clamped on it at the proper place for each observation. At the top are seen two clamping-screws, whose threads work in the upper plate of the slider, and whose points press downwards, upon the back-arch, the ends of a long broad spring that lies under the upper plate. This upper plate takes hold of the under side of the back-arch by the cramp-shaped pieces at the two ends (seen imperfectly in fig. 16, the end of one is seen perfectly in fig. 17). When mounted on the back-arch, the length of the upper plate is

parallel to the length of the back-arch. Upon recollection, I am inclined to think that the right-hand screw presses with its point upon the upper plate, and draws upwards (by its thread) a sliding cramp-shaped piece $\sqcap$. To the upper plate is attached (or rather is in the same piece of plate-brass) a plate projecting forwards (*i. e.* farther from the great spindle), carrying the concave screw of the micrometer; below it, the concave screw of the guard-screw; on one side, the machinery for registering the whole number of turns. The micrometer-head is divided into thirty-four parts, intended (I suppose) for seconds. The micrometer-axis has a pinion of eight, working in a concealed wheel of forty, which carries a pinion of seven, working in a wheel of forty-two: a portion of this wheel is seen through a cut in the end plate, carrying figures for the whole revolutions. The concave screw of the micrometer is split, and a screw, whose head is seen in fig. 16, nearly in the line of the micrometer axis, presses the two parts together. Below this are seen, in fig. 16, two small screws; they merely hold on a small plate which covers up the screw threads. The end of the micrometer screw is not pointed, but nearly spherical. The guard screw works in a brass split crossways. There is a small piece at the left-hand extremity of fig. 16, which I do not remember or understand.

Fig. 17 is an end view of the slider, looking at the micrometer head; every part of it has been described under fig. 16. When the observer has turned his face towards the great spindle, the micrometer and guard-screws are at his right hand.

Fig. 18, *Plate* XV. This is a perspective view of the sector, as mounted on its spindle, complete. At the top is the transverse beam of the tripod top. A brass block is attached to its lower surface, and in this the pivot (whose upper part is cut with a deep screw-thread) works, so that the conical point of the pivot can be brought down to the depression requisite for entering properly into the deep conical hole at the top of the spindle shewn in fig. 2. The circular piece with holes for handspikes is a part of the pivot. Above it is a circular piece with milled head; this works on the thread of the upper part of the pivot, and is to lock it fast. The bracket, seen partially in figs. 1 and 2, is here seen well. The plumb-line shade is seen well; at the top it is firmly attached to the piece mentioned under fig. 1; near the

bottom it is attached to the frame carrying the counterpoise weights, but not firmly; there being a screw to move it through a small distance sideways. At the bottom the plumb-line shade carries a stirrup of brass, whose bottom is a circular plate, on which stands the plumb-bob pot. To one side of this stirrup is screwed (by a milled-head screw) a piece carrying a stalk, which carries the split tube for the lower microscope: this stalk is moved endways by a milled-head screw. The bottom of the spindle is seen; it turns with a conical hole on a conical point, as at the top; but the point has no adjustment upwards. This point is attached to or part of a sort of inverted dish; in the sides of the dish are four powerful screws, which press against the sides of a large stud that is firmly fixed to the lower cross-beam of the tripod, for adjustment sideways. To the face of the spindle, at the bottom, is attached a projecting piece of brass; and on the inverted dish are two stops, by which the spindle can be reversed in azimuth almost exactly: there is a milled-head screw passing through the piece of brass, for fixing it to either stop, and thus setting the spindle fast in azimuth. The back edge-bar of the spindle can be seen, deepest in the middle. The slider for the illuminating lamp can be seen. The iron bar on the spindle, to which the counterpoise frame is attached, can be seen. The back arch can be seen well, but the iron bar by which it is carried cannot be seen; on the right hand, two screws, which connect it with the projecting pieces that fasten it to the iron bar, can be seen. The slider is seen upon the back arch, and the roller-frame, &c. attached to the telescope; and the figure shews the relative position which they always have, the two rollers being included between the two cramp-pieces, with sufficient play for the action of the micrometer-screw. The great spring is seen, spanning over the back arch. The counterpoise weights are for the purpose of pressing the steel mirror with proper force against the point of the micrometer-screw.

Fig. 19, *Plate* XVI., is a perspective view of the tripod-stand and its surrounding stage, without the spindle or any part of the sector. The lower transverse bar has a good back edge-bar. The apertures, in the upper frame, between the transverse bar and the triangular sides, serve for the telescope to look through in opposite positions of the spindle. The surrounding stage is for the observer to walk round, for examining the bisection of the upper dot; it does not touch the tripod-stand any where. The whole is so constructed

that it may be taken to pieces and packed in cases for transportation. The legs of the tripod are, I think, but 2 inches thick; but the bracing makes the tripod very stiff and firm.

I shall now subjoin a few notes on the history of the instrument and the changes which it has undergone.

The instrument was completed, it appears, in August 1727 (*Phil. Trans.* Vol. XXXV. p. 643), and was mounted at Wansted; where it remained apparently till 1749. The history of its removal to Greenwich is contained in the following statement extracted from a manuscript in BRADLEY's handwriting preserved in the Safe-Room at the Royal Observatory.*

"In the year 1749, 1000*l.* was given by His Majesty, to be paid by the Treasurer of the Navy out of monies arising from the old stores of the navy (upon the representation of the Lords of the Admiralty, and principally upon Lord ANSON's recommendation), to buy some astronomical instruments for the use of the Royal Observatory, when it was proposed by Mr. FOLKS, Mr. GRAHAM, and Mr. ROBINS, who were consulted with on that occasion, that, in the catalogue of instruments to be purchased, a *parallactick sector* should be inserted as very useful for observing stars near the zenith; and the sector which I had formerly hung up at Wansted in 1727 (with which I had afterwards discovered the laws of the aberration of the fixed stars, as also the nutation of the earth's axis), being judged by them worthy of a place at the Royal Observatory, I removed it from Wansted in July 1749, and procured a new apparatus for suspending it (made by Mr. HEARN, as the old one was); and I likewise took care, while the rooms of the new Observatory were building, that there might be made convenient places for hanging the sector, both in the new Quadrant-Room and in the Transit-Room. My view (in providing for its suspension in either room) was to render it useful for settling the true zenith distances of such stars as come within its reach (or within $6\frac{1}{4}°$ on either side of the zenith), thereby errors of the lines of collimation of the telescopes of the mural quadrants may be found with greater ease and certainty."

I cannot extract this account without expressing my astonishment that no better method was devised by BRADLEY for reversing the instrument than carrying it from one wall to another.

* The number of this manuscript, in the present arrangement of the MSS. at the Royal Observatory, is 204.

It appears probable, from an estimate cited by Professor RIGAUD from BRADLEY'S papers (BRADLEY'S *Miscellaneous Works*, p. lxxvi.), that the price of the sector was 45*l.*

The next entry that I find is the following:*

"1750, Aug. 13. Examining the object-glass of the parallactick sector, I found that the screw (which should press it firm in the cell) was loosened, so that when I had pressed the glass down as much as I could in the cell, the screw had room to turn a great way before it touched the glass again. I therefore screwed it in as far as I could without injuring the glass, and then made a mark on it opposite to the middle of that end of the axis on which the plummet hangs, and so let it remain in that situation in order to find whether the line of collimation is altered by what I did to the object-glass; for I suspect that the difference between the zenith point, as found now and last January, may be owing to the glass not lying fixed in the same position in the cell.

"From the mean of all the observations, taken from Aug. 3 to Aug. 23, the zenith point of the sector is 38° 23′ 45¾″, or about 1¼″ different from what I before found in January last."

Nothing further, except occasional notices of the shifting of the sector from room to room, of the zenith point, &c., occurs in the few papers of BRADLEY'S preserved at the Royal Observatory. In some of his manuscripts, at the Bodleian Library, at Oxford, (which Professor JOHNSON, at my request, has had the goodness to examine), there occur repeated determinations of the value of the divisions; of which the following are the principal results:

Manuscript marked B: "In these comparisons the zenith point of the sector is 38° 23′ 45″·5. The angle shewn by the sector greater than that by the new quadrant 2″·25 for every degree, and greater than that shewn by the old quadrant 1″·25 for every degree, by the 96 division.

"The above numbers are the mean of the observations made from Aug. 14, 1750, to October, 1752."

Manuscript marked D. It is stated that, in January and February 1754, the zenith point was found to be 38° 23′ 45″·35; the angle shewn by the sector, when in the Transit-Room, was greater by 2″·6 in a degree than by the new quadrant, and by 2″·1 in a degree greater than by the old quadrant with Mr. BIRD'S

* MS. No. 201.

division; and, when in the Quadrant-Room, greater by $2''\cdot3$ in a degree than by the new quadrant, and greater by $1''\cdot5$ in a degree than by the old.

In September, 1754, the angle was found to be greater by $2''$ in a degree than that shewn by either quadrant.

These numbers were found by comparing the zenith distances of stars several degrees apart, as found with the sector and with the quadrants (manuscript marked C).

The following notes occur in Dr. MASKELYNE's papers, and are for the most part printed in his *Observations*.

1768, July 12.* "This day Mr. BIRD set up the zenith sector of $12\frac{1}{2}$ feet radius, which he has cleaned and put in order, in the Transit-Room. He has also altered the manner of suspension of its plumb-line, which before was hung from a notch made precisely at the centre of the instrument; but it is now suspended from a notch a little above the centre, and the notch is moved by means of a screw, so that the silver wire, which is the plumb-line, may appear through a microscope to pass over and bisect a fine point placed at the centre."

1776, Nov. 5. "Weight added to the plummet: it now weighs $1\frac{1}{2}$ lb."

1776, Nov. 6. "Found the instrument bear too little on southernmost of three triangular screws at top; altered the bearing of this and the opposite screw till, on moving the instrument to different zenith distances, the plumb-line still kept to the point in the centre. Before, on only turning the micrometer-screw nine revolutions, the plumb-line shifted a great deal with respect to the central point."†

In the printed *Transit Observations*, Vol. II. p. 160 (1779, October 22), is a long note describing several alterations made in the buildings in the summer of 1779, in which, after mentioning that the flat ceilings had been taken away from the Transit and Quadrant-Rooms, Dr. MASKELYNE says, "The western wall of the Quadrant-Room thus raised has been applied to good use, as a new place of support from whence to suspend the zenith sector, when removed from the eastern wall of the same room in order to be turned into a contrary position, instead of placing it on the western wall of the Transit-Room, which was less commodious, being at too great a distance from the mural quadrants."

* MS. No. 329.

† It would seem from this that the form of the pivot was faulty.

The brackets and the attachments for the back arch, for mounting the sector in its two positions, were in the Quadrant-Room (one on the eastern wall, the other on the western wall) till within a short time. They were removed on the occasions of converting the western side of the Quadrant-Room into a fire-proof-room (in 1839), and of making some alterations in the Computing-Room, which required the erection of a staircase and the piercing of new doorways on the eastern side of the Quadrant-Room (in 1841): the openings in the roof remain as they were.

"1785.* A steel arch with divisions to every five minutes of zenith-distance upon gold pins has been substituted, instead of the brass arch by the late Mr. Sisson, so that now the instrument requires no correction, either for the total arc or for the different rates of expansion and contraction of the arch and telescope by heat and cold, as they are both made of the same metal. Moreover, the horizontal wire in the focus of the telescope has been sunk in a deep groove, that it may never touch the vertical wire, as was done with the wires in the focus of the transit and south quadrant telescope in 1784. A guard, also, has been applied to the plumb-line, to defend it from the impulse of the air, and the plummet-pot has been fixed to the guard, with a short broad plummet, that the observations may now be made, even in the zenith, without ever taking up the plummet; a circumstance which much facilitates the observing a number of stars in succession in the same night. The placing the lamp for enlightening the wires at a much greater distance from the object-glass than formerly, as well as the enlargement made in the opening of the roof in 1779, cannot but conduce to the greater exactness of the observations."

The name of the artist who constructed the new arc is not mentioned; but from the next entry it appears beyond doubt that it was Troughton. This is the arc which is still on the sector. The illuminating apparatus here described as new is probably that now used; the old one being probably a small disk in front of the object-glass.

"1785, Nov. 19. The plummet of the zenith sector weighed $9\frac{3}{4}$ [ounces, I suppose]. The plumb-line broke in air with $19\frac{5}{8}$ ounces. I took out $1\frac{5}{8}$ ounce, to reduce it to 18 ounces. Mr. Troughton soldered lead on the inside to make it weigh exactly 18 ounces."

* MS. No. 329.

At the end of Dr. MASKELYNE'S printed *Quadrant Observations* for 1801 is the following note, of which I have not found the original manuscript, although a short memorandum is contained in MS. No. 338:—

"An excellent achromatic object-glass, with an aperture of $3\frac{1}{2}$ inches diameter, has been fitted by Mr. DOLLOND to the same tube, instead of the original one of the common sort, and of about 3 inches longer focal length; and the finest wires of about $\frac{1}{1000}$ of an inch in diameter fixed in the focus, instead of the former ones of about $\frac{1}{500}$ of an inch. The same eyeglass is retained as before, for the convenience of observing, with the plumb-line always remaining in its place, stretched by the plummet immersed in water. The telescope magnifies about seventy times, as before. The thickness of the gilt silver wire plumb-line is $\frac{1}{218}$ of an inch, and it is stretched by a weight of 18 ounces, as before."

This is the object-glass now in the sector. The increase of focal length explains the insertion of the tube in the object end of the telescope, exhibited in fig. 6.

The method of using the sector has always been the following: — Direct the telescope to the expected place of the star, and clamp the slider (fig. 16, &c.) By means of the adjusting piece seen in figs. 3, 4, and 5, cause the plumb-line to pass truly over the upper dot. Then, if there is sufficient time before the star's entry into the field, use the micrometer-screw (fig. 16, &c.) to make the nearest dot of the limb pass under the plumb-line, and read off its number of turns and subdivisions. When the star enters the field, use the same micrometer-screw to make the wire in the field of view bisect the star. The difference between the two readings is evidently the quantity, which must be added to or subtracted from the reading expressed by the graduation of the dot, to give the star's zenith distance, still subject to an error of collimation, which will be eliminated by reversing the instrument. If time permit, it is prudent again to read the micrometer with the dot under the plumb-line, as the observer will thus ascertain the firmness of the slider-clamp during the observation.

In judging of the merits of this instrument, it must be remarked that, in common with all other instruments of the same class, it is liable to one of these inconveniences; that, if the plumb-line hangs at a sensible distance

Verification and Extension of La Caille's Arc of Meridian.

Plans of Bradley's Zenith Sector.

Fig. 2. End view of the top of the great spindle &c.

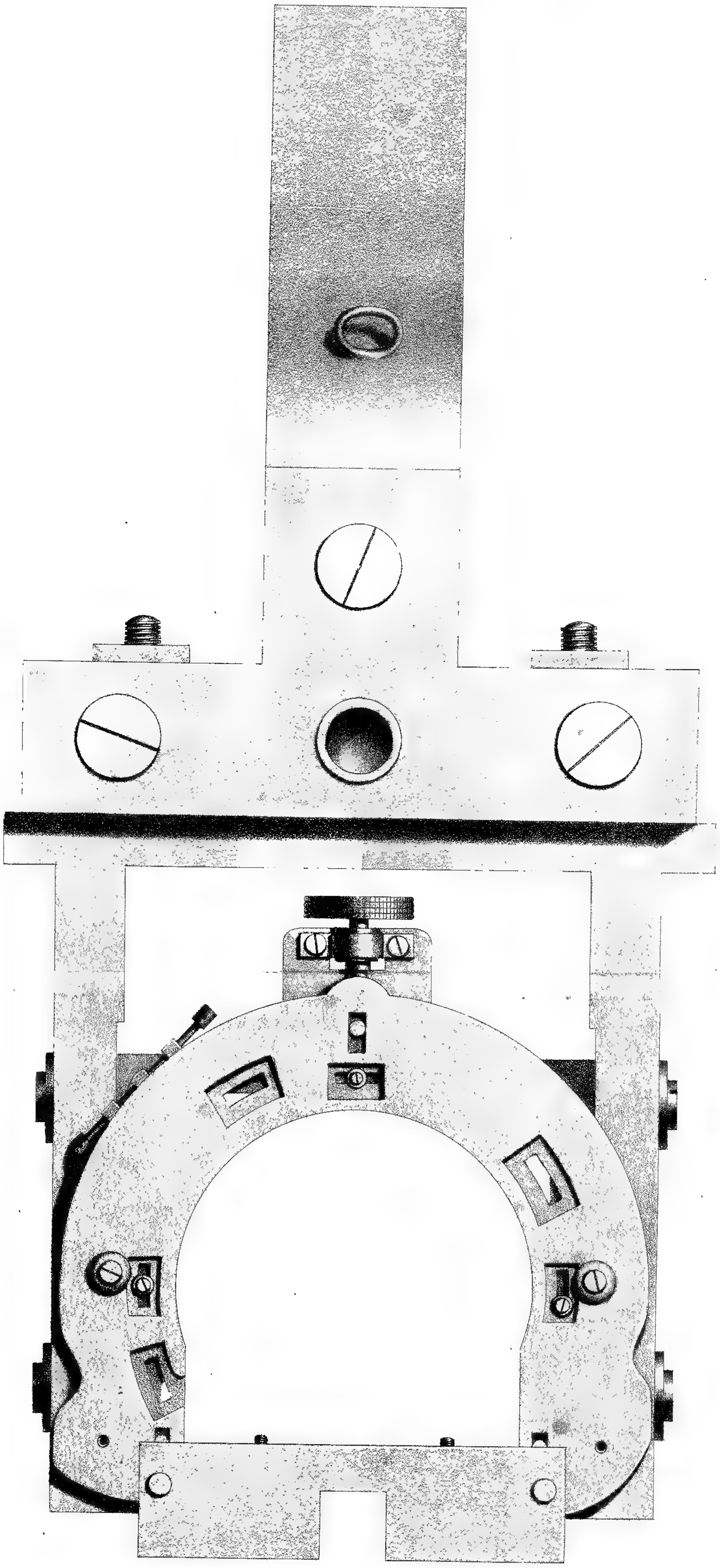


Fig. 1. Side view of the top of the great spindle &c.

SCALE of INCHES.

1 2 3 4 5 6 7 8

J. Basire, Lith.

Verification and Extension of La Caille's Arc of Meridian.

Plans of Bradley's Zenith Sector.

Fig. 3.

View of the triangular frame which rests upon the upper horse shoe and supports the pivots of the telescope.

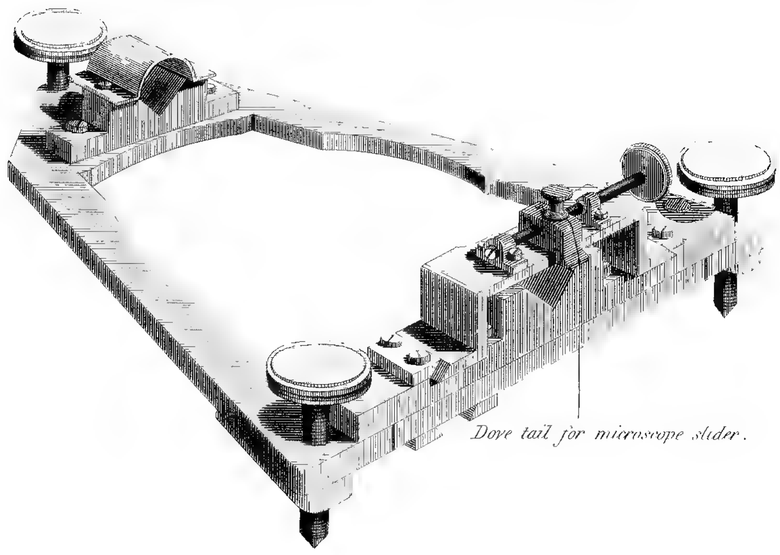


Fig. 4.

Plan of the triangular frame.

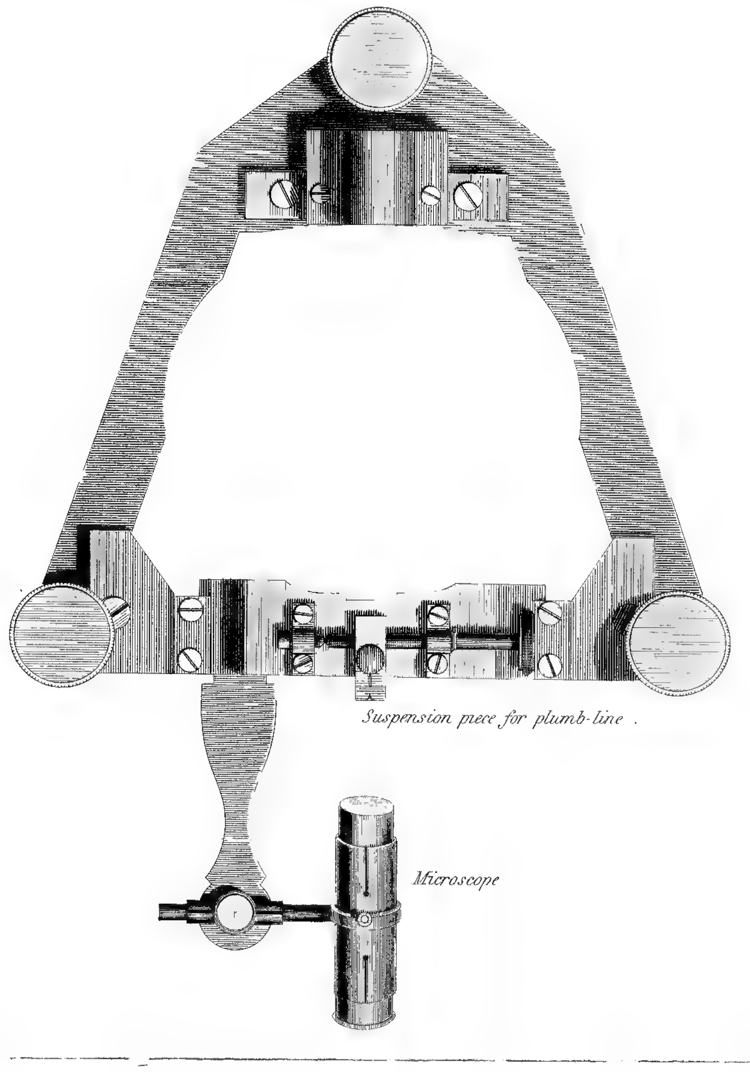
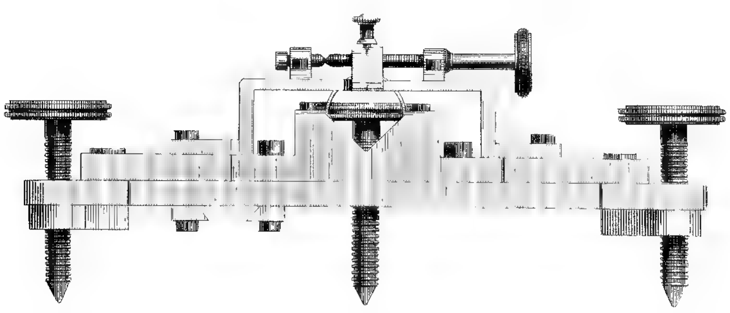


Fig. 5.

Front view of the triangular frame.



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1 2 3 4 5 6 7 8 9

Fig. 8. Sector arc and eye piece plate.

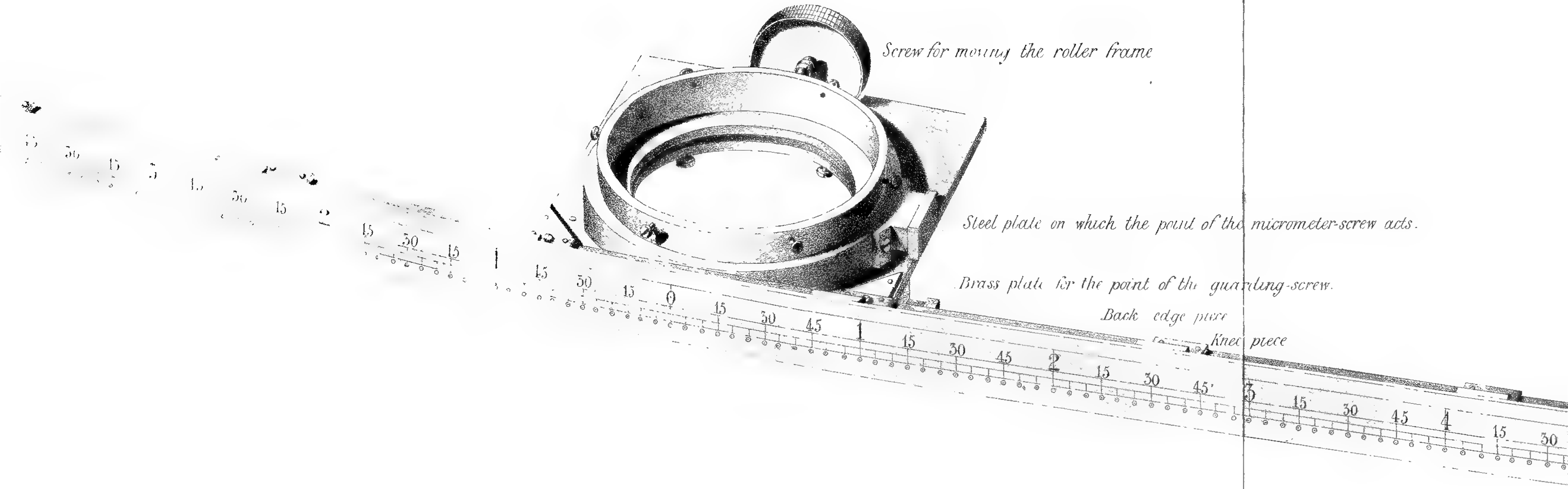

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Fig 9. Plan of Sector Arc, and Eye piece plate as seen from above

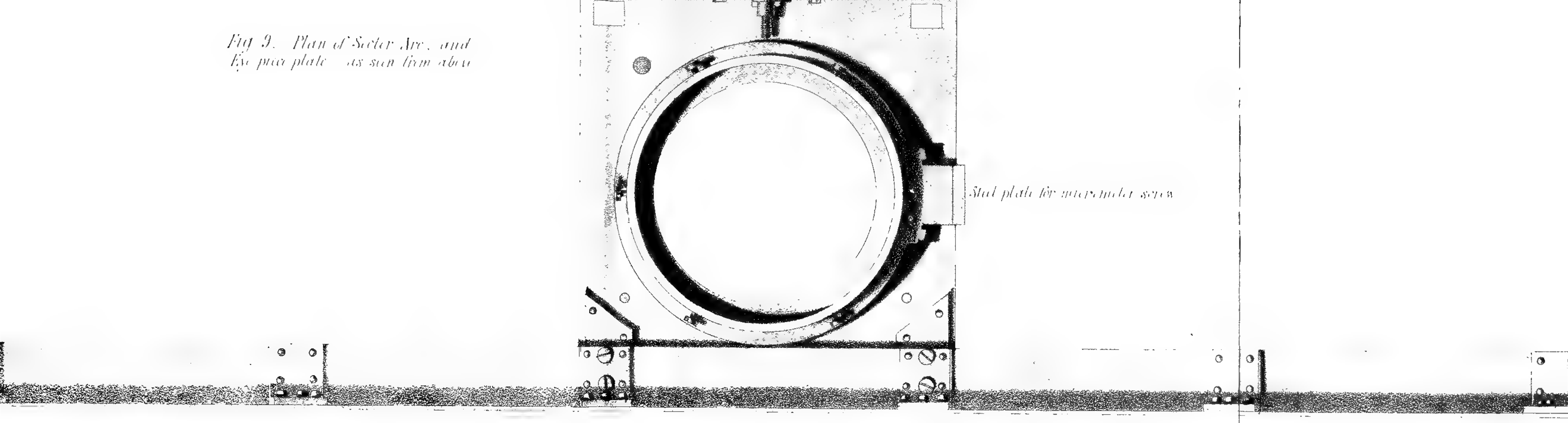


Fig 10. Plan of Sector Arc and Eye piece plate as seen from below

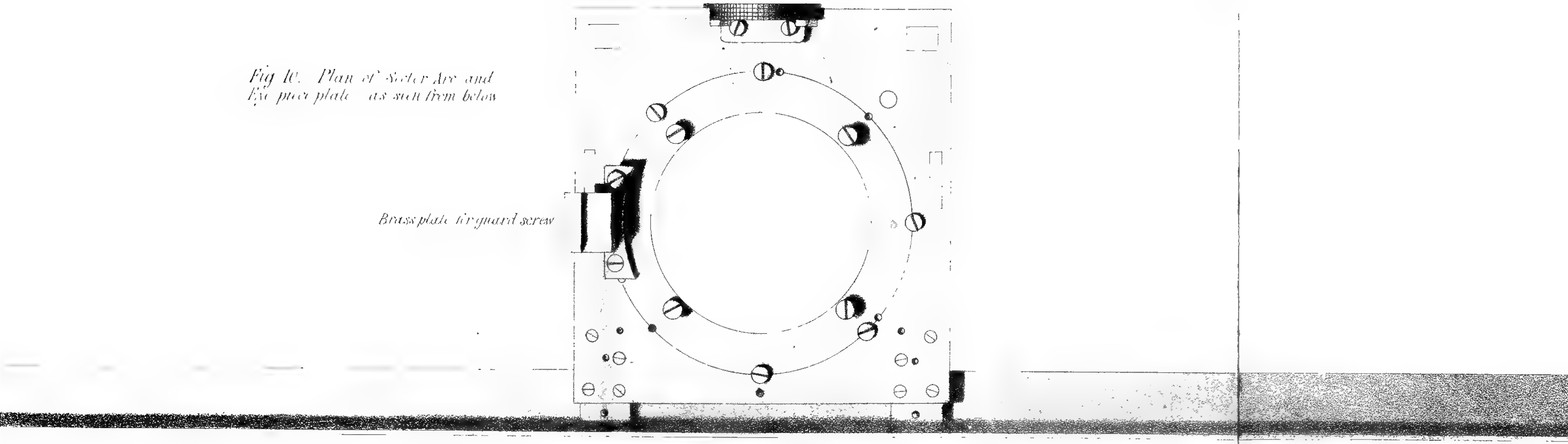


Fig 11. Plan of Sector-arc, as seen endways, and Eye piece plate

Verification and Extension of La Caille's Arc of Meridian

Plates of Bradley's Zenith Sector

Fig 12. Side View of eye piece cell

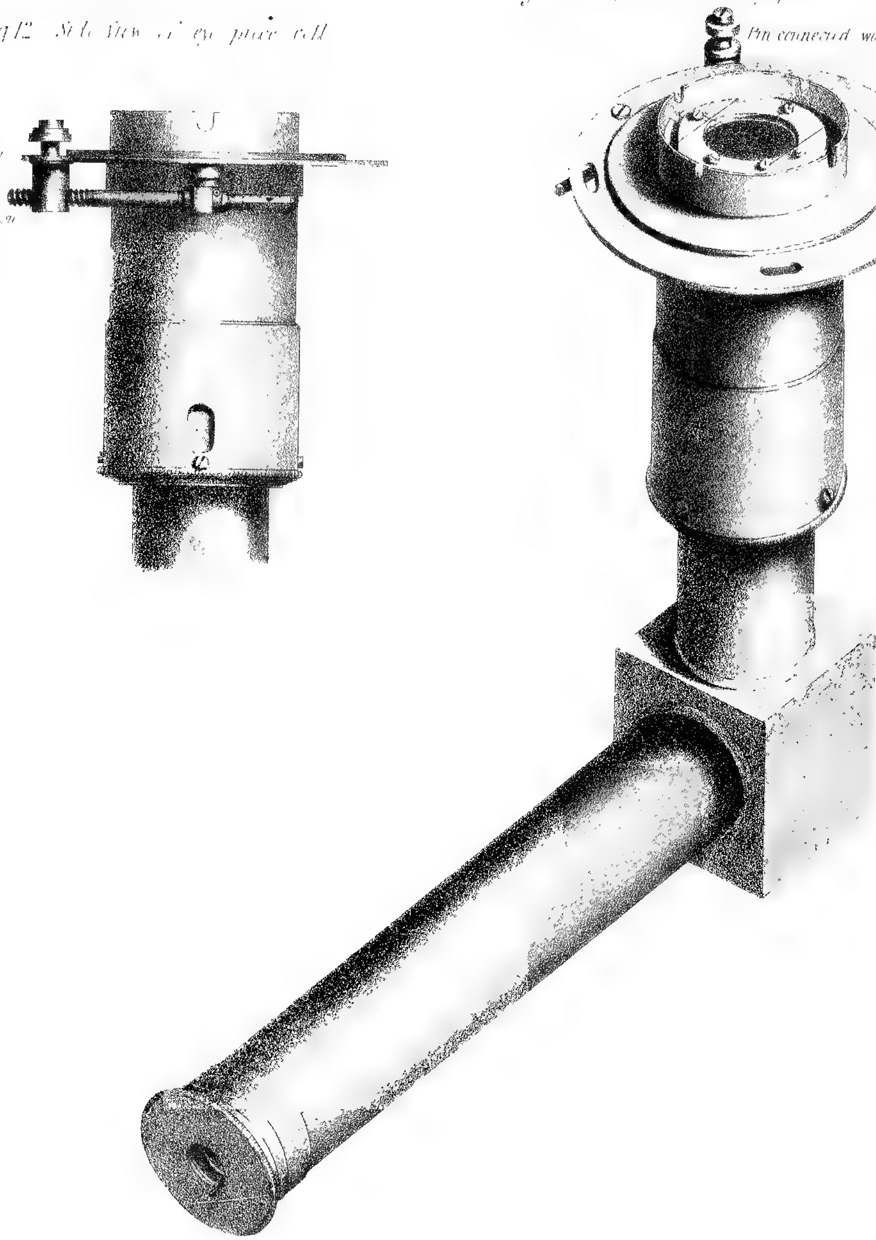


Fig 13. Perspective view of eye piece cell.

SCALE of INCHES

1 2 3 4 5 6

Basire Litho

Plans of Bradley's Zenith Sector.

Fig 14. View of roller frame

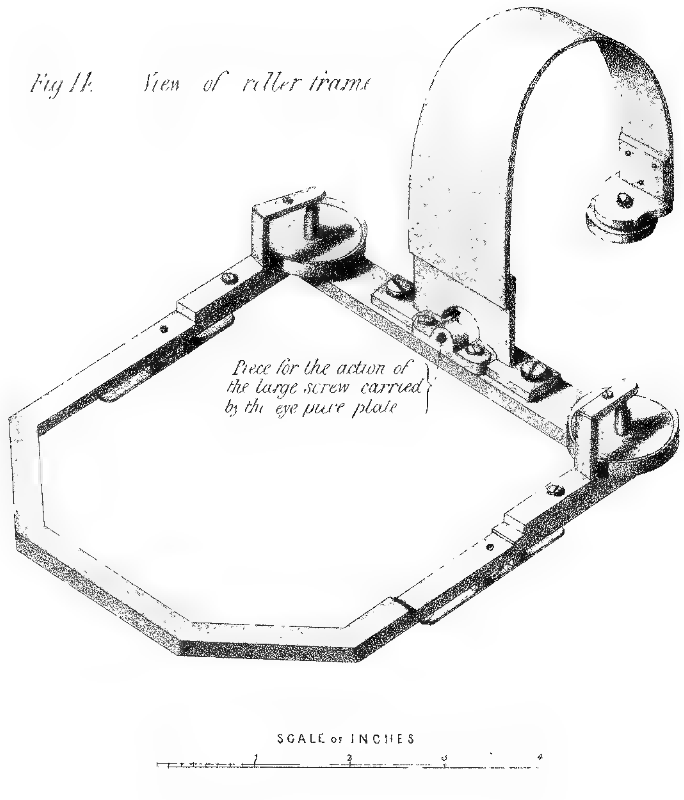


Fig 15. View of eye-piece plate, sector arc, eye piece cell and roller frame; as connected.

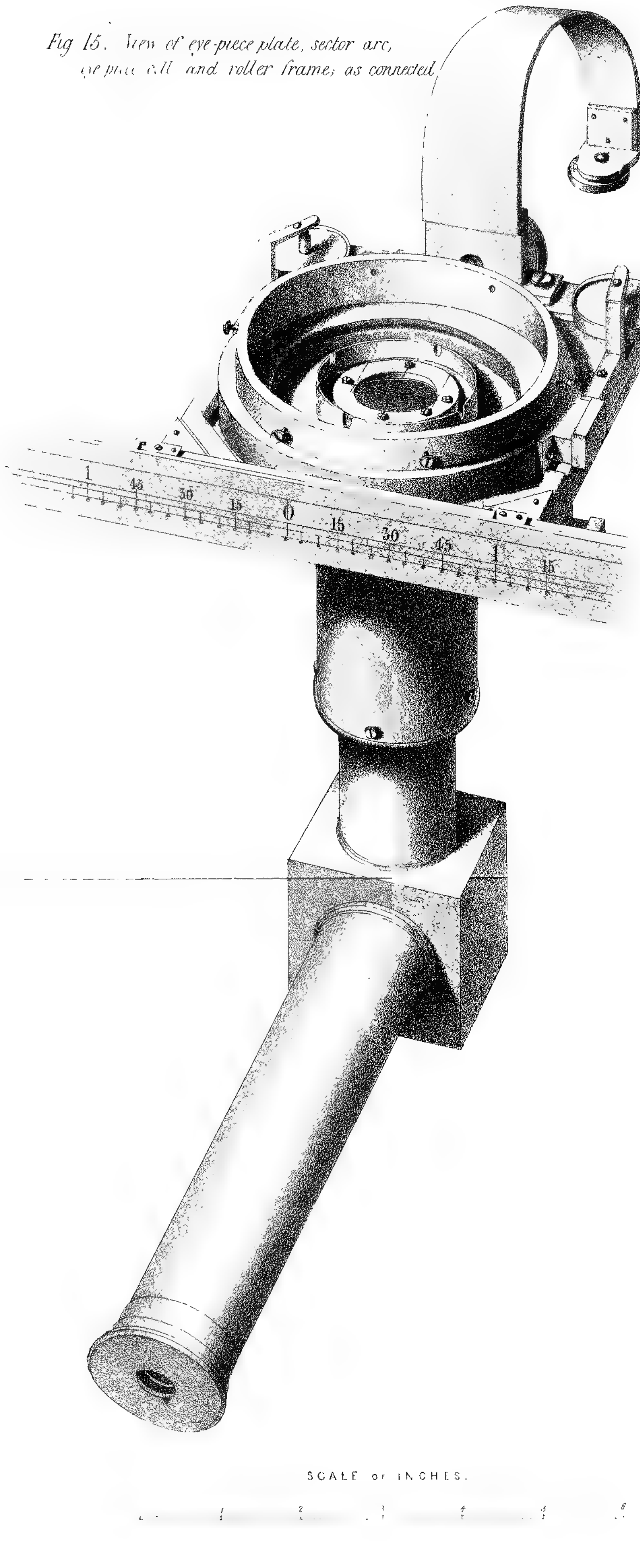
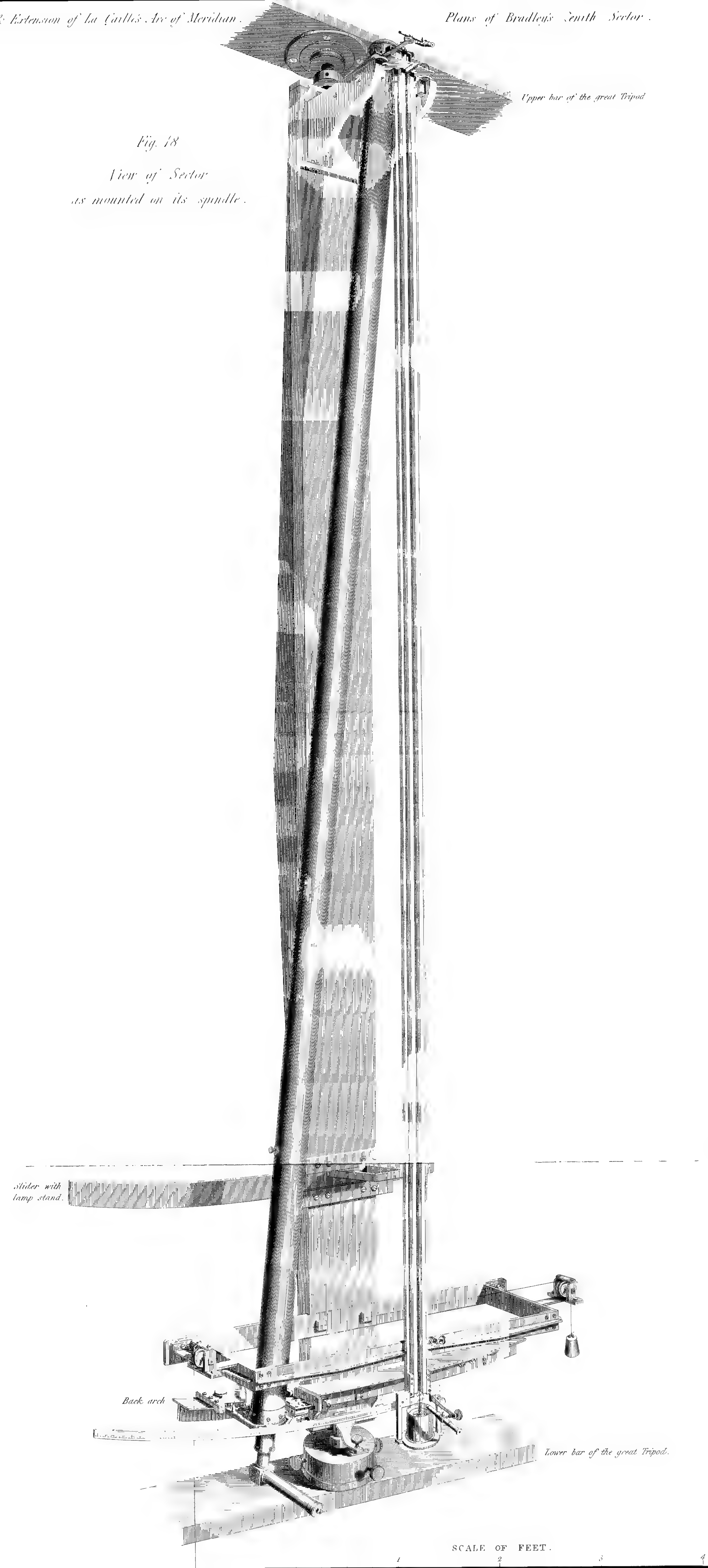


Fig. 18

View of Sector
as mounted on its spindle.



from the limb, it is difficult, without very great care, to pronounce on the bisection of the dot on the limb by the wire; and if it hangs very close to the limb, there is danger of derangement to its position by scraping on the limb. The adjustment for distance of the limb from the plumb-line is made by the large screw seen in figs. 8, 9, and 14; and can undoubtedly be made with great delicacy; but if the tube be not sufficiently bent by the action of this screw, the bearing upon the Y's in figs. 3, 4, 5, will be disturbed, and it will be necessary to adjust the foot-screws of the triangular frame. Moreover, in common with all other instruments of the same class, it is liable to this inconvenience, that it is impossible to ascertain with it the zenith distances in both positions of the instrument on the same night; and it would, from this cause, be liable to inaccuracy if there were any sensible change, either in the relation of the upper dot to the object-glass, or in that of the limb to the eye-piece-wire. Against this latter defect, perhaps, it may be considered as secured in a great measure by the general excellence of its mechanical connexion.

On the whole, I have no hesitation in saying that, though I do not consider the instrument as faultless, I esteem it as one of the best specimens of a very admirable class.

§ 8. History of the Operations with Bradley's Sector for the Verification of the Astronomical Amplitude of La Caille's Arc.*

The sector was delivered to me in Table Bay, by Captain Maitland of H. M. Ship Wellesley, on the 9th of December, 1837, and was conveyed the same day to the Royal Observatory under my personal superintendance. On the 10th the cases were opened, and the instrument put together, and erected in the centre room.

This room was originally constructed for a zenith tube, with apertures of limited dimension; it therefore became necessary to enlarge them by sawing through a portion of the iron bars of the grating forming the floor of the lantern and of the rafters above. The former tedious operation, together with the construction of supports and shutter for the roof, occupied nearly a month. In the meantime a tent and tripod for its support were made in the Dockyard at Simon's Bay under the superintendance of Mr. J. Deas Thomson.

* Mr. Maclear's account recommences here.—G. B. A.

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Experiments were made on the weight to be invariably attached to the plumb-line, a list of stars was selected for observation, and a variety of other details settled, in which Sir JOHN HERSCHEL cordially assisted with his advice; no instructions having arrived with the sector.

When the alterations in the room were completed, a few observations were made, principally for practice in the use of the instrument. On the 24th of January, 1838, it was taken down and replaced in the several packing-cases. The necessary permission having been obtained from Mrs. DE WITT, the proprietor and occupier of the house, No. 2, Strand Street,* Cape Town, the cases containing the frame-work were conveyed thither on the 25th in waggons, and the case containing the sector followed on the 27th (suspended from bamboos, and thus carried by a number of coolies), and was safely deposited in a store-room belonging to Mrs. DE WITT.

The site of LA CAILLE's Observatory is covered by a large building two stories high, on the north-west side of the yard. The upper story forms the sleeping rooms of Mr. VANSITART, a relative of Mrs. DE WITT, and the lower is a receptacle for household stores: hence the sector could not be placed exactly on LA CAILLE's station. The building just mentioned, with other offices and cottages erected since 1752, circumscribe the dimensions of the open court to an area scarcely sufficient for the sector-tent in breadth; while the lower side is occupied by hen-coops, water-barrels, &c. to which the domestics require constant access: thus, not affording space for stretching the tent-ropes in the usual way. But as there was no other place on the premises where the observations could be made, there was no choice; accordingly the 26th and 27th of December were occupied in taking up the paving-stones to get a level bearing for the tripods, and in raising the frame-work. A number of iron pins were driven into the interstices at those places where ropes might be lashed, and the best dispositions were made to secure the canvass against the effect of the wind, by laying stones upon its lower edge.

The sector was raised and adjusted on the 29th, and the same evening the observations commenced.

It is not necessary here to enter into the minute details connected with the observations; for reasons to be mentioned hereafter, they were continued to the 19th of February, 1838, under very disadvantageous circumstances,

* La Caille's southern station. See Part I. page 6, &c.

principally from the violence of the south-east wind acting on the unstretched canvass, and the showers of sand carried into the tent from the streets. The plumb-line was seldom at rest when the wind prevailed, and the quantity of sand may be inferred from the fact, that before moving the clamp on the back-arch, for each successive observation, it was necessary to clear it from sand.

As the object for which these observations were made is intimately connected with the influence of Table Mountain on the direction of the plumb-line, it was thought desirable to place the sector on a spot selected by Sir JOHN HERSCHEL and myself some days before the sector was dismounted.

The spot referred to is at the north front of Table Mountain, about 1100 feet above the level of the sea, and close up towards the precipitous front of the mountain. For distinction, it is named the "Plaate Klyp" (flat stone) station; but is several hundred yards on the mountain-side of the flat granite rock known by that name. The latter is contiguous to the highest house on the ascent to Table Mountain, the property of a person of the name of ENGELBRAGHT.

There is a waggon-way as far as a water-mill; from thence to ENGELBRAGHT'S house there is a horse-path; beyond, the ascent is abrupt and difficult.

The sector and frame-work were placed in their respective cases on the 19th of February: on the 20th the box containing the sector was carried as before, suspended from bamboos, by a number of coolies up to the station. Although the conveyance of a heavy instrument up the steep ascent and over the rocks beyond was a laborious undertaking, it was accomplished by sunset. The frame-work was conveyed as far as the mill in waggons, the remainder of the way by coolies.

It is here necessary to state that the bisecting wires were found too thick for several of the stars employed in this investigation; when the definition was good, the smaller stars were invisible behind the wire; therefore on the 20th I substituted cobweb.

The 21st and 22d were employed in levelling the ground, and in the erection of the sector. The observations began on the 24th; on which day I received the instructions of the Lords Commissioners of the Admiralty drawn up by the Astronomer Royal.

The wind was stronger at this station than in Cape Town, but more steady. The tent-pins were soon drawn from the ground; I therefore had the ground lowered all round, and suspended heavy stones to the canvass. Likewise to secure the instrument from being overturned by a sudden gust (a circumstance by no means unlikely), stay-ropes were led from the top of the tent-tripod to the neighbouring trees.

A sufficient number of observations having been obtained, the sector was dismounted on the 13th of March, and fixed in its packing-case, and was then carried by coolies to the office of the Royal Engineer department in Cape Town, where it was protected by the sentinel on duty. The frame was removed to the same place on the following day, being carried down the steep descent by coolies, and the remainder of the journey by waggon.

Of the two roads to Klyp Fonteyn, the north extremity of LA CAILLE's arc, the one through Groene Kloof, in the direction of Saldanha Bay, is over sand or a sandy soil for nine-tenths of the distance, therefore well suited for preventing injury to the sector from jolting. To hire bullock-waggons by this route was now my immediate object; and, to avoid the inconvenience of shifting from one waggon to another, it was desirable to engage one set for the whole journey. No waggon-owner in the neighbourhood of Cape Town could be found willing to go the whole way, nor indeed farther than Groene Kloof (33 miles); therefore, to guard against detention farther on, I made application to the Colonial Office for an order on the several field cornets, which was willingly granted; and, armed with this document, I prepared for immediate departure.

As the accurate reverification of the amplitude of the arc under investigation depended upon my being certain of LA CAILLE's north station, the arrangements for the journey contemplated a thorough inquiry into the question, by cutting up the ground within the known limits; and, as none are better qualified than the Royal Engineer department for such duty, I applied to His Excellency General NAPIER for a couple of sappers under the command of Lieut. WILLIAMS of the Royal Engineers; a request which was obligingly granted, although at the time the sappers were much wanted elsewhere.

The party now consisted of Lieut. WILLIAMS, Royal Engineers; Corporal SMITH, Sapper; — SHARP, Gunner; JOSEPH GIBBS, Carpenter; CONRAD ENGELBRAGHT, and JOHN WALLACE.

The instruments, besides the sector, were

DOLLOND's Repeating Circle,
A Sextant,
A Chronometer,
Spirit Level, }
Azimuth Compass, } Borrowed from the Engineer Department.
Measuring Chain, }
Two Mountain Barometers, }
Signal Flags, and a number of trenching implements.

The sector, with its frame-work, tent, and tent-tripod, occupied two waggons. The repeating circle, chronometer, and barometer, with our personal baggage, were packed in the Ordnance waggon lent by Colonel LEWIS for the purpose.

1838, March 15. The bullock-waggons not appearing at the time appointed for starting, the sappers and GIBBS were left in charge, and at 3^h P.M. Lieut. WILLIAMS and myself proceeded with the Ordnance waggon as far as Blue Berg, which we reached at nightfall.

March 16. Arrived at the Groene Kloof missionary station in the afternoon.

Observed latitude of the Institution, 33° 30′ 5″.

Some of the coloured people at this excellent institution have, by industry, acquired personal property. The worthy superintendant, the Rev. Mr. LEMMERS, sent for those who had bullock-waggons, but their demand exceeding the sum I expected, I rode off to the nearest field cornet, Mr. VAN REENAN, with my official document from the Colonial Office, who recommended me to close with the Hottentots, as from the heavy sands, and the poverty of oxen at this season of the year, he doubted if I should be more fortunate elsewhere. On renewing the negotiation, only one waggon and two span of oxen could be engaged for the whole journey; and the superintendant, that I might not be detained, was so good as to lend the institution-waggon for the next stage.

The gathering together of the oxen from the downs, with other delays on the part of the Hottentots, kept us at Groene Kloof three days. We set out on the 20th, at 4^h P.M., and reached field cornet SCHALKWYK's, on Zwartland Plain, shortly after nightfall.

March 21st. Hired a waggon and span of oxen from the field cornet.

Started at noon, and arrived at Uly Kraal, the farm of JASPER SMIDT, by nightfall.

It is proper to mention, that the order on the field cornets was not so efficient as I expected; I therefore sent off a letter to the Civil Commissioner in Cape Town, to ascertain the real extent of its power, in order that I might not be delayed on my return. I received Mr. BORCHARD's reply at Klyp Fonteyn with a more imperative mandate inclosed; but I was not compelled to use it.

March 22d. JASPER SMIDT's oxen were at a distant farm; but he supplied me with a waggon and horses. We started at 1^h P.M. and reached Portuguese Fonteyn by 10^h at night.

Observed latitude of Portuguese Fonteyn, 33° 1′ 13″.

March 23d. Hired a waggon and span of oxen of Mr. BESTER. Set out at 1^h 45^m, and arrived at Mr. MELK's of Kerston Fonteyn, on the Berg river, at 7^h P.M.

March 24th. With a waggon and oxen hired from Mr. MELK, we set out early in the morning, and reached Klyp Fonteyn about sunset.

In the selection of a spot for the sector, I was guided in some measure by the facilities afforded in a large firm circular floor (for treading out corn), composed of pot-clay, situated at and rather within the south extremity of the ruin supposed by Captain EVEREST to be the granary of LA CAILLE; and in part by the uncertainty whether the local investigation about to be undertaken by the sappers would prove successful. Within the limits of inquiry there could be no sensible difference of effect on the plumb-line from local causes, while any point could be referred to the floor.

The straw and rubbish having been swept off, the sector was taken from its case, laid on the floor, and carefully cleaned. In this necessary operation the several pieces forming the bearings and upper adjustments of the tube were separated and cleared from sand and dust. In the meantime the tripods were raised, and lines drawn on the floor in the direction of the meridian and perpendicular, by means of the sun's transit. The tent was next raised and fixed to iron pins driven into the floor; after which the tube was placed on its bearings, and the two barometers suspended from the sector tripod.

At the distance of 21 feet exactly, and due east of the sector axis, a nail

was driven into the floor, over which the axis of the repeating circle was placed.

As all remarks relating to the weather, with other memorandums connected with the sector-work, are annexed to the observations in their proper places, it is only necessary here to state, that the night of March 27th was spent in the adjustment of the sector by transits over the meridian, that the observations for zenith distance began on the 28th, and that they were discontinued on the 21st of April, a sufficient number having been made for settling the question of the amplitude.

March 28th. From fresh information obtained on the spot, the sappers and GIBBS began their operations by cutting trenches in various directions. They soon encountered a foundation, which being traced proved to be that of a dwelling-house, distant about 70 yards north of the sector. The ground being dry and hard, and the weather extremely hot, this work took up nearly five days.

April 6th. This day the sappers succeeded in discovering another foundation to the west of the former, some of it from two to three feet below the surface. The dimensions in some measure correspond with the description given by LA CAILLE, in his journal, of the granary he occupied.

April 12th. Lieut. WILLIAMS and the sappers were engaged in making a map of the farm by actual measurement with the chain.

April 14th. Started with Lieut. WILLIAMS, — GIBBS, CONRAD ENGELBRAGHT, and a guide, at daybreak for the summit of Piquet Berg, which we reached at nine o'clock. Before our departure the barometers were compared; their indications were

$$\text{No. } 518 = 29\overset{\text{in.}}{\cdot}693. \quad \text{Ther. } 58^\circ.$$
$$\text{No. } 249 = 29\cdot698. \quad \text{Ther. } 57.$$

On the mountain, No. 249 was suspended from a small tripod made of cane. At $9^h\ 12^m$, the time arranged for simultaneous observation, the mercury stood at $27^{in}\cdot603$; thermometer, $49^\circ\cdot1$.

The day was unfavourable for obtaining an extensive view of the surrounding country; misty with mizzling rain. About noon it partially cleared up. On our return, the barometers were again compared, when the pointer of the stationary one was found separated from the vernier. The observer had marked the height of the column on the scale at the time appointed

$= 29^{\text{in}}\cdot 764$. However, as some uncertainty attaches to his observation, and as it gives the altitude of the mountain about 170 feet greater than was afterwards obtained with the repeating circle, no use has been made of it.

From this day to the 20th, Lieut. Williams, with the sappers and Gibbs, were continually engaged in their investigations on the ruins and plan of the place, and in the measurement of a base line. On the latter day, the exposed foundations were closed in. The 21st, 22d, and 24th, were employed in taking horizontal angles and zenith distances with the circle, and in levelling from the sector station to the base line. I set out with Lieut. Williams and a guide at daybreak, on the morning of the 23d, to examine the character of the country north of the station. We rode on about fifteen miles, where, from a hill, we obtained a view of about seventy miles, so commanding as to render a closer investigation of it unnecessary. Our time, with other circumstances, precluded the possibility of a longer journey. On our return, the sappers had dug a pit under the axis of the sector (that instrument having been dismounted on the 22d) to the depth of rather more than three feet, where they encountered a rock, in which they chiselled a hollow to receive a quart bottle, as is described in Part I. page 41.

April 25th. Having agreed with Conrad Cotsee, a farmer, for three span of oxen and two waggons for the whole way to Cape Town, we left Klyp Fonteyn at 1^h P.M. this day, and halted at nightfall at the farm, Zout Kloof (Salt valley).

Observed latitude, 32° 54′ 0″.

April 26th. Started at 3^h A.M. and reached Mr. Melks on the Berg river at daybreak, where we halted till 2^h P.M. when we again started and reached an open outspan.

Observed latitude, 33° 1′ 0″.

April 27th. Left at 4^h A.M. Halted at Mr. Fister's farm about daybreak, from whence we started at 2^h P.M. and reached an open outspan in the night.

Observed latitude, 33° 25′ 0″.

April 28th. Left at 4^h A.M. Reached Uly Kraal by break of day, near to the place where La Caille's base-line traverses the waggon-way.

Accompanied by Lieut. Williams, I took this opportunity to explore the direction of the line. At 1^h P.M. we proceeded on our journey, and by 8^h P.M. we arrived on the Capoc Berg ridge, near to Contre Berg.

April 29th. Set off at 4^h A.M. and arrived at the Groene Kloof Missionary Station about 7^h, from whence we started at 2^h P.M. and reached Drie Fonteyn, the farm of Mr. KUSS, at 6^h 40^m.

Observed latitude, 33° 39′ 0″.

April 30th. Started from Drie Fonteyn at 5^h 30^m A.M. and arrived at Mr. FESTER's farm by sunrise; from whence we started at 1^h P.M. and arrived at Mr. BESTER's, of Langflea, at 7^h P.M.

May 1st. Left Mr. BESTER's at 9^h A.M.; arrived at the Observatory at 4^h P.M.; but the waggons proceeded on to Cape Town with the instruments, where WM. FIELD, Esq. H. M. Collector of Customs, kindly permitted them to be deposited in his private store.

It is now necessary to state why the sector was taken a second time to Cape Town.

A cursory comparison of the observations shewed that those made at the south extremity did not deserve the confidence required in a work of this kind, where the length of a few feet is a matter of importance, and, as was very properly stated in the instructions, "*it is indispensable that the observations be of unexceptionable goodness.*" The list of stars had been increased, partly to supply the place of those daily becoming invisible from gliding into daylight; and the substitution of cobweb for the unusually thick wires admitted of greater precision in the bisections of the smaller stars; to which may be added that increased accuracy might now be expected from the increased experience in the observer.

I knew from the past that good observations could not be obtained under a tent in Mrs. DE WITT's yard; I therefore sought for some building close to the station, in which the sector could have fair play; and fixed upon Roggebay Guardhouse, a building in charge of the Board of respective Officers, and let by them to a tenant at will.

Having obtained leave of the tenant, the Board granted permission to make a hole in the roof and to sink the floor, so that the sector might be brought underneath the rafters, I undertaking to reinstate all in its former condition when the observations should be completed.

I must here acknowledge my obligations to my friend Lieut. WILLIAMS, who smoothed the way for obtaining this favour, and to Col. LEWIS, the

commandant, for various kinds of assistance throughout the work; indeed, the value of the zealous co-operation of the engineer department can only be estimated by those acquainted with the Cape of Good Hope. In the friendship of these two gentlemen I was particularly fortunate.

The brick floor was taken up, and the soil underneath removed to the depth of three feet in the centre of the room, where the sector was erected on the 7th of May, one week after my return from Klyp Fonteyn.

The winter having set in early, no observations could be obtained until the 12th. Afterwards frequent interruptions occurred from the state of the weather; six weeks, from this cause, were expended on a work that in fair weather might have been performed in two.

The sector was dismounted on the 30th of June and removed to the Customhouse, from whence it was carried to the Observatory by coolies on the 2d of July, and again erected in the sector-room.

On inspection, the instrument was found as perfect as when I received it, without the slightest mark of injury. The only alterations in its details are the substitution of spider lines for thick wires, and the addition of trays to the tripod, for supporting the lamp opposite the upper dot. At the guardhouse I was compelled to shorten the feet of the stage, but on the return of the instrument to the Observatory new ones were made.

As a field instrument it is only defective in one particular, viz. in a contrivance for referring the plane of the arch to a fixed mark. Merely looking along the arch is not sufficient, as the lower end of the plumb-line-shade intercepts the line of sight along the divided surface. A telescope cannot be fixed to the tube; if attached to the spindle, its parallelism with the arch might vary, and is difficult to verify. As a substitute, small sight vanes are now constructing to clamp on the flanch of the arch. They will be very light, and it is hoped will save much time in the adjustments, and much calculation (as will be presently seen), and will expel that want of confidence as to the azimuthal position, which has been the cause of many hours being devoted to trial-and-error adjustments, that would otherwise have been spent in the real objects of the sector.

On this point it may be right to explain more at length the importance of referring to a fixed mark.

1st. In the absence of an azimuth-circle, the two stops require two inde-

pendent adjustments, and several transits are required for each. These are reduced to one by means of a fixed meridian mark with two points on it.

2dly. In a climate where the variations in temperature within twenty-four hours often amount to 45°, the frame-work is liable to swerve; therefore it requires a constant check.

3dly. The coefficient for the error in azimuth within the limits of the arch is small, and the transit at one wire being liable to an error of half a second, several transits must be observed on the same night, thus dividing the attention; and experience teaches me that the attention should not be so divided, as, for instance, when the thundering noise of the wind compels the observer to hold a box-chronometer to his ear while he is bisecting a star.

By these remarks I must not be understood to imply that transits over the meridian should be neglected; on the contrary, I conceive the observer is in duty bound to produce them, not only for his own satisfaction, but to satisfy the public that the instrument was in its proper position. For this purpose, three or four observations will be sufficient, as an error of observation, amounting to half a second or more, when the instrument is kept nearly in the meridian by the mark, is of no consequence.

In other respects BRADLEY's sector is a perfect instrument; the independence of its parts and the simplicity of their combination are worthy of the master hand that contrived it.

The position of the sector in the Guard-house has been permanently marked in the following way:—

Before the hollow occupied by the sector was filled up, a block of granite, about three feet long, was placed upright on a base of brick and mortar, so that its top should be even with the floor. It was then inclosed in a case of masonry, by building it round with brick and mortar. The floor was then raised and paved with bricks.

The top of the block is dressed smooth and contracted to one foot square, and is even with the floor.

The centre of the square surface is the position of the axis of the sector.

§ 9. Methods employed for the Reduction of the Observations, and Abstract of the Result of all the Observations.

The barometers employed at Klyp Fonteyn were made by Mr. Thomas Jones, and are the property of the Royal Engineer department.

From a comparison of their indications with the meteorological journal kept at the Royal Observatory, it appears that the station at Klyp Fonteyn is 485 feet above the mean level of the sea.

The barometer employed in the Guard-house was made by Mr. Dollond, and is the property of the Observatory.

This station is close to the sea-beach. The feet of the sector could not be more than two or three feet above high water.

The chronometer employed at both stations is by Arnold, and numbered 326. It beats half-seconds. It went solar time at Klyp Fonteyn; but, finding the inconvenience of this in sidereal observations, I had the rate altered to sidereal time before the observations in the Guard-house began. The performance at Klyp Fonteyn was good; at the Guard-house the reverse; for which I am unable to assign any cause beyond the circumstance, that in my absence it was on one occasion allowed to run down.

The error of the chronometer at Klyp Fonteyn was usually obtained by altitudes near the prime vertical: that in Cape Town by means of journeyman pocket-chronometers carried to and from the transit-clock at the Observatory. From some unaccountable cause (perhaps misplacement of the comparison entries) a portion of them is not available. However, as the error and rate, when the latter is tolerably regular, are eliminated in the solution of the equations for determining the error in azimuth, the investigation of the rate by independent means is little more than a matter of prudent curiosity.

Shortly after the commencement of the observations at Klyp Fonteyn, the error of collimation in right ascension of the meridian wire was found to be inconveniently large in the adjustment of the arch by transits. An attempt was made on the 3d of April to diminish it; but, from stiffness in the frame, proved unsuccessful. Therefore, before the error in azimuth can be determined, it is necessary to know the distance of the meridian wire from the visual axis.

As the transit of a star within a few minutes of the zenith is little affected by the error in azimuth; if we assume the rate of the chronometer to be

constant, the successive transits of a star in the alternate positions of the limb east and west ought to give the error of collimation of the middle wire.

Let T, T′, T″, be the times by chronometer of the successive transits, c the error of collimation expressed by its value in time for an equatorial star, r the rate of the chronometer in 24 hours, Æ the star's right ascension, y the secant of its declination, and e the error of the chronometer,

then,
$$\begin{aligned} Æ + e + cy \quad\quad\; &= T \\ Æ + e - cy + \;\; r &= T' \\ Æ + e + cy + 2r &= T'' \end{aligned}$$

Hence
$$\begin{aligned} + r - 2cy &= T' - T \\ + r + 2cy &= T'' - T' \end{aligned} \qquad \text{and } c = \frac{T'' + T - 2T'}{4y}.$$

An analogous process applies when one of the intervals of the transits is not a single day. Thus,

KLYP FONTEYN.

Astro. Society's Catalogue, No. 1969; Zenith Distance, 0° 14′ North; $cy = c \times 1{\cdot}185$.

April 15,	Æ $+ e - cy$	=	15ʰ	31ᵐ	58ˢ·0,	face West
16,	Æ $+ e + cy + r$	=	15	28	4·0	East
18,	Æ $+ e - cy + 3r$	=	15	20	7·0	West
19,	Æ $+ e + cy + 4r$	=	15	16	16·0	East
20,	Æ $+ e - cy + 5r$	=	15	12	15·0	West
21,	Æ $+ e + cy + 6r$	=	15	8	23·5	East

By 15th, 16th, and 18th, $c \times 7{\cdot}110 = 9^s{\cdot}0$
By 16th, 18th, and 19th, $c \times 7{\cdot}110 = 15{\cdot}0$
By 18th, 19th, and 20th, $c \times 4{\cdot}740 = 10{\cdot}0$
By 19th, 20th, and 21st, $c \times 4{\cdot}740 = 9{\cdot}5$

$c = \frac{43^s{\cdot}5}{23{\cdot}7} = 1^s{\cdot}83$; and the middle wire is between the spindle and visual axis.

Astro. Society's Catalogue, No. 848; Zenith Distance, 0° 22′ North; $cy = c \times 1{\cdot}184$.

April 1,	Æ $+ e + cy$	=	6ʰ	5ᵐ	59ˢ·0,	face East
4,	Æ $+ e - cy + 3r$	=	5	54	5·0	West
5,	Æ $+ e + cy + 4r$	=	5	50	15·0	East
6,	Æ $+ e - cy + 5r$	=	5	46	13·0	West
9,	Æ $+ e + cy + 8r$	=	5	34	30·0	East

By 1st, 4th, and 5th, $c \times 9{\cdot}472 = \overset{s}{24{\cdot}0}$
By 4th, 5th, and 6th, $c \times 4{\cdot}736 = 12{\cdot}0$
By 5th, 6th, and 9th, $c \times 9{\cdot}472 = 23{\cdot}0$

$$c = \frac{\overset{s}{59{\cdot}0}}{23{\cdot}68} = \overset{s}{2{\cdot}49}.$$

Astro. Society's Catalogue, No. 1378; Zenith Distance, 0° 18′ South; $cy = c \times 1{\cdot}192$.

		h	m	s		
April 15,	$\text{Æ} + e - cy$ =	10	11	0·5,	face	West
16,	$\text{Æ} + e + cy + r$ =	10	7	9·0		East
18,	$\text{Æ} + e - cy + 3r$ =	9	59	12·5		West

$$c = \frac{\overset{s}{13{\cdot}5}}{7{\cdot}152} = \overset{s}{1{\cdot}89}.$$

Astro. Society's Catalogue, No. 1070; Zenith Distance, 0° 6′ North; $cy = c \times 1{\cdot}187$.

		h	m	s		
April 6,	$\text{Æ} + e - cy$ =	7	39	13·0,	face	West
9,	$\text{Æ} + e + cy + 3r$ =	7	27	29·5		East
10,	$\text{Æ} + e + cy$ =	7	23	34·5		East
11,	$\text{Æ} + e - cy + r$ =	7	19	33·5		West
15,	$\text{Æ} + e - cy$ =	7	3	52·5		West
16,	$\text{Æ} + e + cy + r$ =	7	0	0·5		East

By 6th and 9th, $c \times 4{\cdot}748 = \overset{s}{6{\cdot}5}$
By 10th and 11th, combined with 15th and 16th, $c \times 4{\cdot}748 = 9{\cdot}0$

$$c = \frac{15{\cdot}5}{9{\cdot}496} = \overset{s}{1{\cdot}632}.$$

The chronometer error was applied in this case, as found by independent means.*

Giving to the four results for c the respective weights 6, 5, 3, 2, the mean = $1^{s}{\cdot}71$† expressed in solar time. $1^{s}{\cdot}72$ was employed in the calculations.

* There appears to be no doubt of the correctness of the process by which the three first values of c are obtained above. Mr. Maclear, in the manuscript, had however given the values 1·661, 1·971, and 1·416. The remark as to the application of chronometer error seems to apply only to the observations of April 6 and 9.—G. B. A.

† For the reasons given in the last note, this value appears to be slightly in error.

CAPE TOWN.

Astro. Society's Catalogue, No. 1915; Zenith Distance, 0° 4′ South; $cy = c \times 1{\cdot}206$.

May 26,	$Æ + e - cy = $	$16^h\ 39^m\ 23^s{\cdot}0$,	face West
27,	$Æ + e + cy + r =$	39 29·5	East
29,	$Æ + e - cy + 3r =$	39 19·0	West
June 17,	$Æ + e - cy =$	39 55·5	West
18,	$Æ + e + cy + r =$	39 57·0	East
19,	$Æ + e - cy + 2r =$	39 42·0	West
21,	$Æ + e + cy + 4r =$	39 36·0	East
23,	$Æ + e + cy =$	39 17·5	East
24,	$Æ + e - cy + r =$	39 1·5	West
25,	$Æ + e + cy + 2r =$	38 59·5	East
26,	$Æ + e - cy + 3r =$	38 46·5	West
27,	$Æ + e + cy + 4r =$	38 45·0	East

		Weights.
By May 26, 27, and 29,	$c \times 7{\cdot}236 = 23^s{\cdot}5.$	0·41
By June 17, 18, and 19,	$c \times 4{\cdot}824 = 16{\cdot}5.$	0·28
By June 18, 19, and 21,	$c \times 7{\cdot}236 = 24{\cdot}0.$	0·40
By June 23, 24, and 25,	$c \times 4{\cdot}824 = 14{\cdot}0.$	0·34
By June 24, 25, and 26,	$c \times 4{\cdot}824 = 11{\cdot}0.$	0·44
By June 25, 26, and 27,	$c \times 4{\cdot}824 = 11{\cdot}5.$	0·42

Mean $c = 2^s{\cdot}66$,* by which the wire is too near the spindle.

The second value should be rejected.

If a weight is given to each in proportion to the reciprocal of the square of its probable error, the mean is $2^s{\cdot}55$.* $2^s{\cdot}65$ was employed in the calculations.

It appears that the collimation in right ascension altered about $0^s{\cdot}94$ in the journey from Klyp Fonteyn to Cape Town; which perhaps arises from one of two causes. The first is, an alteration in the position of the sliding tube which contains the object-glass, and which must be pushed in before the instrument can be packed in its case. The second is, a flexure in the tube by jolting in the waggon, notwithstanding the support of the blocks. The removal from and refixing of the wire frame to the tube is not likely to be the cause of a variation to this amount.

For the investigation of the error in azimuth (Z), the following list of stars is selected; whose right ascensions were determined for this purpose with the 10-feet transit instrument.

* These numbers are probably erroneous to a small amount.

No. of Ast. Soc. Cat.	Mean Right Ascension, Jan. 1, 1838.	Zenith Distance South End of Arc.	Zenith Distance North End of Arc.
	h m s	° ′ ″	° ′ ″
903	7 11 25·52	S. 2 53 20	S. 4 6 35
957	7 39 29·14	S. 3 39 25	S. 4 52 40
1433	12 19 47·18	S. 4 13 40	S. 5 26 53
1527	13 11 30·80	.. .. ..	S. 3 9 30
1821	15 49 24·32	S. 4 0 30	S. 5 13 45
2007	17 22 36·86	S. 3 3 28	S. 4 16 43
2043	17 38 50·10	S. 3 3 50	S. 4 17 5
791	6 14 5·84	N. 3 55 30	N. 2 42 16
869	5 52 15·73	N. 5 9 50	N. 3 56 35
915	7 17 41·29	N. 4 55 40	N. 3 42 25
1084	8 43 15·18	.. .. ..	N. 3 49 57
1243	10 19 44·99	N. 3 40 15	N. 2 27 0
1774	15 28 43·34	N. 4 40 33	N. 3 27 18
1866	16 9 18·69	N. 3 24 30	N. 2 11 15
2079	17 55 24·23	N. 3 30 0	N. 2 16 45
2741	22 48 41·05	N. 3 26 40	N. 2 13 25

The error of collimation in right ascension having been applied with the sign + face west, and − face east, to the observed time of transiting the meridian wire, the star's apparent right ascension was subtracted, and the difference (n), (n'), &c. for each star was arranged in equations of the following form:—

$$\begin{aligned} e - Za + rb - n &= 0 \\ e - Za' + rb' - n' &= 0 \\ e + Za'' + rb'' - n'' &= 0 \\ e + Za''' + rb''' - n''' &= 0 \end{aligned}$$

Where e is the error of the chronometer on sidereal time; a, a', &c. $= \frac{\text{Sin. Zen. Dist.}}{\text{Cos. Dec.}}$; b the time from sidereal noon expressed in decimals of twenty-four hours.

Subtracting the equations for stars south of the zenith from the equations for stars north of the zenith, equations of the following form take place:—

$$\begin{aligned} Z(a'' + a) + r(b'' - b) - n'' + n &= 0 \\ Z(a''' + a') + r(b''' - b') - n''' + n' &= 0 \end{aligned}$$

Treating groups of such equations by the method of least squares, and eliminating *r*, Z becomes known. Thus,

KLYP FONTEYN, March 31st.

No. of Ast. Soc. Cat.	Chron. Time of Transit.	✱ App. Æ.	*n*, *n'*, &c.
	h m s	h m s	s
903	7 11 8·17	7 11 25·87	− 17·70
2007	17 21 17·13	17 22 37·99	− 20·86
2043	17 38 31·95	17 38 51·16	− 19·21
957	7 39 2·76	7 39 29·63	− 26·87
1821	15 48 52·02	15 49 25·79	− 33·77
869	6 53 30·09	6 52 16·05	+ 74·04
1084	8 44 28·27	8 43 16·04	+ 72·23
915	7 18 52·76	7 17 41·73	+ 71·03
1774	15 29 51·10	15 28 44·79	+ 66·01
791	6 15 5·84	6 14 5·97	+ 59·87
2079	17 56 20·72	17 55 25·16	+ 55·56
2741	22 49 35·77	22 48 40·67	+ 55·10
1866	16 10 (18·35)	16 9 20·03	+ (58·32)

No. 1866 is marked doubtful in the original observations.

The equations given by the individual stars are

$$
\begin{aligned}
e - Z \times \cdot 089 \;&+ r \times \cdot 300 \;+ 17\overset{s}{\cdot}70 &= 0 \\
e - Z \times \cdot 093 \;&+ r \times \cdot 724 \;+ 20\cdot 86 &= 0 \\
e - Z \times \cdot 093 \;&+ r \times \cdot 735 \;+ 19\cdot 21 &= 0 \\
e - Z \times \cdot 107 \;&+ r \times \cdot 319 \;+ 26\cdot 87 &= 0 \\
e - Z \times \cdot 116 \;&+ r \times \cdot 659 \;+ 33\cdot 77 &= 0 \\
e + Z \times \cdot 078 \;&+ r \times \cdot 286 \;- 74\cdot 04 &= 0 \\
e + Z \times \cdot 076 \;&+ r \times \cdot 363 \;- 72\cdot 23 &= 0 \\
e + Z \times \cdot 074 \;&+ r \times \cdot 304 \;- 71\cdot 03 &= 0 \\
e + Z \times \cdot 069 \;&+ r \times \cdot 645 \;- 66\cdot 91 &= 0 \\
e + Z \times \cdot 055 \;&+ r \times \cdot 260 \;- 59\cdot 87 &= 0 \\
e + Z \times \cdot 046 \;&+ r \times \cdot 747 \;- 55\cdot 56 &= 0 \\
e + Z \times \cdot 045 \;&+ r \times \cdot 951 \;- 55\cdot 10 &= 0 \\
e + Z \times \cdot 044 \;&+ r \times \cdot 673 \;- 58\cdot 32 &= 0
\end{aligned}
$$

And the equations formed by differences of the equations above are

$$
\begin{aligned}
&Z \times \cdot 194 - r \times \cdot 373 - 107\overset{s}{\cdot}81 = 0 \\
&Z \times \cdot 183 + r \times \cdot 044 - 99\cdot 10 = 0 \\
&Z \times \cdot 167 - r \times \cdot 431 - 90\cdot 24 = 0 \\
&Z \times \cdot 162 - r \times \cdot 079 - 87\cdot 77 = 0 \\
&Z \times \cdot 144 - r \times \cdot 040 - 77\cdot 57 = 0 \\
&Z \times \cdot 162 + r \times \cdot 088 - 89\cdot 33 = 0 \\
&Z \times \cdot 152 + r \times \cdot 632 - 81\cdot 97 = 0 \\
&Z \times \cdot 137 - r \times \cdot 062 - 77\cdot 53 = 0 \\
&Z \times \cdot 171 - r \times \cdot 456 - 94\cdot 90 = 0 \\
&Z \times \cdot 165 - r \times \cdot 063 - 89\cdot 93 = 0 \\
&Z \times \cdot 181 - r \times \cdot 015 - 97\cdot 90 = 0 \\
&Z \times \cdot 162 - r \times \cdot 090 - 86\cdot 12 = 0 \\
&Z \times \cdot 148 - r \times \cdot 464 - 80\cdot 73 = 0
\end{aligned}
$$

From these the following are formed by the method of least squares :—

$$
\begin{aligned}
&+ Z \times \cdot 351486 - r \times 0\cdot 189579 - 191\overset{s}{\cdot}74758 = 0 \\
&- Z \times \cdot 189579 + r \times 1\cdot 181205 + 104\cdot 59669 = 0
\end{aligned}
$$

Of which the solution is

$$
\begin{aligned}
Z &= 544\overset{s}{\cdot}95 = 2^{\circ}\ 16'\ 15'' \\
r &= -1\cdot 09
\end{aligned}
$$

Substituting the value of Z thus found in the terms $Z\,a$, $Z\,a'$, &c., of the original equations, the following results are found :—

No. of Ast. Soc. Cat.	Values of e.
903	$+ 30\overset{s}{\cdot}80 - r \times \cdot 300$
2007	$+ 29\cdot 82 - r \times \cdot 724$
2043	$+ 31\cdot 47 - r \times \cdot 735$
957	$+ 31\cdot 44 - r \times \cdot 319$
1821	$+ 29\cdot 44 - r \times \cdot 659$
869	$+ 31\cdot 53 - r \times \cdot 286$
1084	$+ 30\cdot 81 - r \times \cdot 363$
915	$+ 30\cdot 70 - r \times \cdot 304$
1774	$+ 29\cdot 31 - r \times \cdot 645$
791	$+ 29\cdot 90 - r \times \cdot 260$
2079	$+ 30\cdot 49 - r \times \cdot 747$
2741	$+ 30\cdot 58 - r \times \cdot 951$
1866	$+(34\cdot 34) - r \times \cdot 673$

From these,

Chronometer error at sidereal noon	=	$+\ 30^{s}\!\cdot\!52 - r \times \cdot 524$
The same by independent observations	=	$30\cdot 90 - r \times \cdot 429$

No. 1866, marked uncertain, should have been rejected.

KLYP FONTEYN, April 6th.

No. of Ast. Soc. Cat.	Chron. Time of Transit.	* App. Æ.	n.
	h m s	h m s	s
1527	13 12 2·72	13 11 32·51	+30·21
903	7 11 55·76	7 11 25·73	30·03
2007	17 23 8·39	17 22 38·21	30·18
2043	17 39 22·05	17 38 51·38	30·67
957	7 39 59·37	7 39 29·49	29·88
1821	15 49 55·63	15 49 25·95	29·68
1433	12 20 18·32	12 19 48·78	29·54
869	6 52 47·93	6 52 15·93	32·00
1774	15 29 17·56	15 28 44·94	32·62
791	6 14 37·20	6 14 5·84	31·36
1243	10 20 18·46	10 19 46·18	32·28
2079	17 55 58·11	17 55 25·37	+32·74

$$
\begin{aligned}
e - Z \times \cdot 068 + r \times \cdot 550 - 30^{s}\!\cdot\!21 &= 0\\
e - Z \times \cdot 089 + r \times \cdot 300 - 30\cdot 03 &= 0\\
e - Z \times \cdot 093 + r \times \cdot 724 - 30\cdot 18 &= 0\\
e - Z \times \cdot 093 + r \times \cdot 735 - 30\cdot 67 &= 0\\
e - Z \times \cdot 107 + r \times \cdot 319 - 29\cdot 88 &= 0\\
e - Z \times \cdot 116 + r \times \cdot 659 - 29\cdot 68 &= 0\\
e - Z \times \cdot 121 + r \times \cdot 514 - 29\cdot 54 &= 0\\
e + Z \times \cdot 078 + r \times \cdot 286 - 32\cdot 00 &= 0\\
e + Z \times \cdot 069 + r \times \cdot 645 - 32\cdot 62 &= 0\\
e + Z \times \cdot 055 + r \times \cdot 260 - 31\cdot 36 &= 0\\
e + Z \times \cdot 050 + r \times \cdot 430 - 32\cdot 28 &= 0\\
e + Z \times \cdot 046 + r \times \cdot 747 - 32\cdot 74 &= 0
\end{aligned}
$$

$$
\begin{aligned}
&Z \times \cdot199 - r \times \cdot228 - \overset{s}{2\cdot46} = 0\\
&Z \times \cdot185 - r \times \cdot014 - 2\cdot94 = 0\\
&Z \times \cdot162 - r \times \cdot059 - 1\cdot48 = 0\\
&Z \times \cdot143 - r \times \cdot305 - 1\cdot61 = 0\\
&Z \times \cdot139 + r \times \cdot023 - 2\cdot56 = 0\\
&Z \times \cdot167 - r \times \cdot014 - 1\cdot97 = 0\\
&Z \times \cdot137 + r \times \cdot095 - 2\cdot41 = 0\\
&Z \times \cdot176 - r \times \cdot254 - 1\cdot82 = 0\\
&Z \times \cdot166 - r \times \cdot229 - 2\cdot60 = 0\\
&Z \times \cdot153 + r \times \cdot428 - 2\cdot86 = 0\\
&Z \times \cdot171 - r \times \cdot449 - 1\cdot33 = 0\\
&Z \times \cdot162 - r \times \cdot079 - 2\cdot44 = 0\\
&Z \times \cdot144 - r \times \cdot040 - 1\cdot33 = 0
\end{aligned}
$$

$$
\begin{aligned}
&+ Z \times \cdot34466 - r \times \cdot19983 - \overset{s}{4\cdot52216} = 0\\
&- Z \times \cdot19983 + r \times \cdot66802 + 1\cdot59689 = 0
\end{aligned}
$$

$$
\begin{aligned}
Z &= \overset{s}{14\cdot2} = 3' \, 33''\\
r &= -\ 1\cdot86
\end{aligned}
$$

Values of e.

$$
\begin{aligned}
&\overset{s}{31\cdot18} + r \times \cdot550\\
&31\cdot29 + r \times \cdot300\\
&31\cdot50 + r \times \cdot724\\
&31\cdot99 + r \times \cdot735\\
&31\cdot40 + r \times \cdot319\\
&31\cdot33 + r \times \cdot659\\
&31\cdot26 + r \times \cdot514\\
&30\cdot89 + r \times \cdot286\\
&31\cdot64 + r \times \cdot645\\
&30\cdot58 + r \times \cdot260\\
&31\cdot57 + r \times \cdot430\\
&32\cdot09 + r \times \cdot747
\end{aligned}
$$

The concluded value of e, the error at sidereal noon, is $31\cdot39 + r \times \cdot514$

By independent observations $32\cdot27 - r \times \cdot422$

In a similar way the value of Z has been found each night, presuming the invariability of the position throughout the night. That this was not strictly correct is evident on carrying the eye over the columns; still it is probable that the fluctuations were within such limits as to be insensible on the zenith distances.

The observations of the 28th and 29th of March have not been included in the calculations, because the error in azimuth on those nights was about the same as on the 30th and 31st, and because the transits on those nights are not sufficiently numerous to prove the exact value; also the chronometer rate at the time was very irregular from the recent journey.

I shall now give the final equations* for each night in a tabular form.

AZIMUTHAL ERROR AT KLYP FONTEYN.

Day.	Position of Face.	Equations.	Values of Z.
1838. Mar. 30	East.	$+ Z \times \cdot 366824 - r \times 0\cdot 33152 - 159\cdot 714 = 0$ $- Z \times \cdot 33152 + r \times 130\cdot 981 + 10\cdot 779 = 0$	$436\overset{s}{\cdot}85 = \overset{\circ}{1}\ \overset{\prime}{49}\ \overset{\prime\prime}{13}$
31	West.	$- Z \times \cdot 35146 - r \times 0\cdot 189579 + 191\cdot 7476 = 0$ $+ Z \times \cdot 189579 + r \times 1\cdot 181205 - 104\cdot 5967 = 0$	544·95 = 2 16 15
April 1	East.	Only six observations altogether; three stars give $Z \times \cdot 330 + r \times 0\cdot 000 - 175\cdot 20 = 0$	530·9 = 2 12 44
4	West.	Z is so small that it may be neglected. The sector was adjusted on the 3d.	0·00 0
5	East.	The east stop was not adjusted on the 3d. This night it was accomplished by trial and error. The night being favourable for observation, the zenith distances were recorded, to be employed in the determination of the amplitude. In the calculation of the values of Z for the following intervals, the error of the chronometer derived from extra-meridional altitudes has been employed.	
		From $\overset{h}{5}\ \overset{m}{33}$ to $\overset{h}{7}\ \overset{m}{11}$	181·7 = 0 45 23
		7 11 7 36	442·2 = 1 50 33
		7 36 8 40	45·8 = 0 11 27
		8 40 9 20	83·4 = 0 20 51
		9 20 10 0	55·3 = 0 13 50
		10 0 13 40	66·3 = 0 16 35
		13 40 22 48	13·6 = 0 3 24

* In the manuscript which reached me, the decimal points were universally omitted from the coefficients of these equations, and many of the signs were obviously wrong. Not having leisure

AZIMUTHAL ERROR AT KLYP FONTEYN (*continued*).

Day.	Position of Face.	Equations.	Values of Z.
1838. April 6	West.	$\begin{cases} +Z\times\cdot34466 - r\times\cdot19983 - 4\cdot5222 = 0 \\ -Z\times\cdot19983 + r\times\cdot66802 + 1\cdot5969 = 0 \end{cases}$	$14^{s}\cdot2 = 0^{\circ}\ 3'\ 33''$
7	East.	$\begin{cases} +Z\times\cdot24503 - r\times\cdot14883 - 3\cdot5158 = 0 \\ -Z\times\cdot14883 + r\times\cdot45205 + 3\cdot65943 = 0 \end{cases}$	$11\cdot8 = 0\ 2\ 57$
9	East.	$\begin{cases} +Z\times\cdot1228 + r\times\cdot100 - 1\cdot9409 = 0 \\ +Z\times\cdot100 + r\times\cdot72 - 2\cdot151 = 0 \end{cases}$	$15\cdot1 = 0\ 3\ 46$
10	East.	$\begin{cases} +Z\times\cdot3747 - r\times\cdot180 - 9\cdot1000 = 0 \\ -Z\times\cdot180 + r\times\cdot14644 + 7\cdot2367 = 0 \end{cases}$	$24\cdot5 = 0\ 6\ 7$
11	West.	$\begin{cases} +Z\times\cdot2029 - r\times\cdot1545 - 8\cdot9423 = 0 \\ -Z\times\cdot1545 + r\times\cdot2028 + 7\cdot6396 = 0 \end{cases}$	$36\cdot6 = 0\ 9\ 9$
		(The seconds of No. 1527 and 869 are incorrect.)	
15	West.	$\begin{cases} -Z\times\cdot380434 - r\times\cdot250102 + 37\cdot22053 = 0 \\ +Z\times\cdot250102 + r\times\cdot931297 - 24\cdot14079 = 0 \end{cases}$	$98\cdot1 = 0\ 24\ 31$
16	East.	$\begin{cases} +Z\times\cdot385583 - r\times\cdot157957 - 35\cdot09605 = 0 \\ -Z\times\cdot157957 + r\times 1\cdot11311 + 21\cdot7120 = 0 \end{cases}$	$88\cdot2 = 0\ 22\ 3$
18	West.	$\begin{cases} +Z\times\cdot2628 + r\times\cdot55259 - 20\cdot41655 = 0 \\ +Z\times\cdot55259 + r\times\cdot24410 - 47\cdot4433 = 0 \end{cases}$	$81\cdot1 = 0\ 20\ 16$
19	East.	$\begin{cases} +Z\times\cdot26788 + r\times\cdot4124 - 11\cdot26549 = 0 \\ +Z\times\cdot4124 + r\times 116\cdot04 - 51\cdot9724 = 0 \end{cases}$	$41\cdot6 = 0\ 10\ 24$
20	West.	$\begin{cases} +Z\times\cdot2952 - r\times\cdot959 - 10\cdot7287 = 0 \\ +Z\times\cdot959 - r\times 97\cdot79 - 45\cdot112 = 0 \end{cases}$	$36\cdot0 = 0\ 9\ 0$
21	East.	$\begin{cases} +Z\times\cdot371578 - r\times\cdot45925 - 9\cdot9490 = 0 \\ -Z\times\cdot45925 + r\times\cdot884289 + 5\cdot2787 = 0 \end{cases}$	$26\cdot9 = 0\ 6\ 44$

The value of Z at the south station being always within certain limits, and the rate of the chronometer variable, the equations were formed so as to diminish the effect of the latter as much as possible. The method of least squares was adopted in only a few cases.

to repeat from the beginning Mr. MACLEAR's investigation, I have contented myself with finding, by trial, such positions for the decimal points, and such signs, as are consistent with the values of Z. No figures are altered.— G. B. A.

AZIMUTHAL ERROR AT CAPE TOWN.

Day.	Position of Face.	Equations.	Values of Z.
1838.			
May 12	West	.. ..	Insensible.
13	East	$-Z\times{\cdot}168+r\times{\cdot}083+8{\cdot}19=0$; $-Z\times{\cdot}166+r\times{\cdot}013+6{\cdot}99=0$ to $13^h\ 20^m$	$40^s{\cdot}86 = 10'\ 13''$
		$+Z\times{\cdot}137-r\times0{\cdot}14-4{\cdot}18=0$; $+Z\times{\cdot}160-r\times0{\cdot}90-3{\cdot}75=0$ from 13 20 to 22 48	$32{\cdot}08 = 8\ \ 0$
15	West	$+Z\times{\cdot}327+r\times{\cdot}596-2{\cdot}76=0$; $+Z\times{\cdot}275+r\times{\cdot}250-3{\cdot}45=0$	$25{\cdot}87 = 6\ \ 28$
17	West	$+Z\times{\cdot}26535-r\times1{\cdot}2740-11{\cdot}64259=0$; $-Z\times{\cdot}255+r\times73{\cdot}23+169{\cdot}3641=0$	$32{\cdot}72 = 8\ \ 11$
21	East	$+Z\times{\cdot}144165+r\times{\cdot}57708-11{\cdot}08782=0$; $+Z\times{\cdot}14026-r\times{\cdot}573966-9{\cdot}9866=0$	$76{\cdot}02 = 19\ \ 0$
22	West	$+Z\times{\cdot}486-r\times{\cdot}097-40{\cdot}75=0$; $+Z\times{\cdot}022+r\times{\cdot}234-1{\cdot}68=0$	$83{\cdot}71 = 20\ \ 56$
26	West	$+Z\times{\cdot}874+r\times{\cdot}369-63{\cdot}37=0$; $-Z\times{\cdot}010-r\times1{\cdot}5211+1{\cdot}52=0$	$72{\cdot}28 = 18\ \ 4$
27	East	$+Z\times{\cdot}819+r\times{\cdot}311-26{\cdot}51=0$; $-Z\times{\cdot}037-r\times1{\cdot}686-{\cdot}074=0$	$32{\cdot}66 = 8\ \ 10$
28	West	Only two stars for this determination. $+Z\times{\cdot}179+r\times{\cdot}015-10{\cdot}14=0$	$56{\cdot}66 = 14\ \ 10$
29	West	$+Z\times{\cdot}921-r\times{\cdot}0078-46{\cdot}420=0$; $+Z\times{\cdot}034+r\times{\cdot}2872-2{\cdot}740=0$	$50{\cdot}43 = 12\ \ 37$
June 2	East	.. ..	Insensible.
3	East	Five observations only this night. $+Z\times{\cdot}166-r\times{\cdot}09-6{\cdot}10=0$	$36{\cdot}2 = 9\ \ 3$
4	East	The transits for azimuth are all north of zenith in consequence of interruptions from clouds. $+Z\times{\cdot}271+r\times{\cdot}283-9{\cdot}57=0$; $+Z\times{\cdot}034-r\times{\cdot}314-{\cdot}960=0$	$34{\cdot}59 = 8\ \ 39$
6	East	$Z\times{\cdot}648+2^s{\cdot}117-25{\cdot}96=0$	$36{\cdot}80 = 9\ \ 12$

When the instrument was not reversed, a reference to the original observations will explain the reason.

AZIMUTHAL ERROR AT CAPE TOWN (*continued*).

Day.	Position of Face.	Equations.	Values of Z.
1838.			
June 7	West	$+Z\times\cdot101+r\times\cdot236-9\cdot65=0$ from 5h 50m; $+Z\times\cdot111+r\times\cdot025-8\cdot59=0$ to 11 30	$75^s\cdot6=18'\ 54''$
		$+Z\times\cdot070-r\times\cdot014-0\cdot57=0$ from 11 30; $+Z\times\cdot071+r\times\cdot010-1\cdot05=0$ to 14 0	12·8 = 3 12
		$+Z\times\cdot144-r\times\cdot110-12\cdot52=0$ from 14 0 to 15 30	87·0 = 21 45
		$+Z\times\cdot625-r\times\cdot79-6\cdot219=0$ from 15 30; $-Z\times\cdot79+r\times3\cdot33+6\cdot79=0$ to 22 48	11·1 = 2 47
8	East	$+Z\times\cdot1596-r\times\cdot425-5\cdot1650=0$; $+Z\times\cdot053-r\times1\cdot448-2\cdot370=0$	32·24 = 8 4
14*	West	$+Z\times\cdot138+r\times\cdot023-8\cdot53=0$; $+Z\times\cdot138+r\times\cdot012-8\cdot81=0$	83·11 = 20 47
17†	West	$-Z+r\times\cdot178+3\cdot20=0$; $+Z\times\cdot640-r\times\cdot18-0\cdot703=0$	11·04 = 2 45
18	East	$+Z\times\cdot823+r\times\cdot944-29\cdot240=0$; $+Z\times\cdot40-r\times27\cdot08+153\cdot8=0$	28·53 = 7 8
19	West	.. ..	Insensible.
21	East	$+Z\times\cdot955+r\times\cdot869-21\cdot020=0$; $-Z\times\cdot01+r\times1\cdot696+14\cdot170=0$	29·6 = 7 24
22	West	$+Z\times\cdot774+r\times\cdot719-38\cdot990=0$; $+Z\times\cdot018+r\times1\cdot747-17\cdot220=0$	41·62 = 10 24
23	East	$+Z\times\cdot439+r\times\cdot009-10\cdot570=0$; $+Z\times\cdot01+r\times\cdot511+5\cdot188=0$	24·3 = 6 5
24	West	$+Z\times\cdot398+r\times\cdot006-14\cdot863=0$; $-Z\times\cdot006+r\times\cdot253+1\cdot646=0$	37·23 = 9 18
25	East	$+Z\times\cdot161-r\times\cdot072-6\cdot53=0$; $-Z\times\cdot012+r\times\cdot314+2\cdot89=0$	37·08 = 9 16
26	West	$+Z\times\cdot163-r\times\cdot204-3\cdot86=0$; $+Z\times\cdot001+r\times\cdot285-2\cdot54=0$	34·84 = 8 42
27	East	$-Z\times\cdot1632+r\times7\cdot3975+10\cdot5248=0$; $+Z\times1.0227-r\times1\cdot632-18\cdot9703=0$	16·87 = 4 13

* It appears probable that one of the coefficients of Z on this day is erroneous.

† Probably a coefficient of Z has been omitted.

The correction of the observed zenith distance depending on the value of (Z) was computed from the formula

$$Z^2 \times \frac{2 \sin^2 \frac{15''}{2}}{\sin 1''} \times \frac{\cos \text{Latitude} \times \sin \text{Zen. Dist.}}{\cos \text{Declination.}}$$

where Z is supposed to be expressed in seconds of time.

The computations were verified by means of the line of squares on the sliding rule.

The corrections for precession, aberration, and nutation were calculated by means of the constants in the Royal Astronomical Society's Catalogue, recomputed for the year 1838; excepting for the three stars which have the numerals of the Brisbane Catalogue.

The run of the micrometer at Klyp Fonteyn was ascertained on the morning after the observations terminated. The temperature during the examination was 79°·5; at one period 83°. At Cape Town, the second morning after the observations there, in the temperature of 61°.

One Revolution at Klyp Fonteyn	=	$33''\cdot6153$
——— at Cape Town	=	$33\cdot6143$

It appears by this that a variation of 19° of temperature is insensible in the run.

The details of the examinations will be found below.

In the arrangement of the results, all the corrections are entered in detail with the view of checking the calculations or facilitating combinations.

Comparing the error of collimation on the 30th and 31st of March with the error of collimation afterwards, the disturbance of the wire frame does not appear to have produced any sensible difference. In like manner, comparing the observations before the 19th of June with those of the 20th and 21st, the removal of the object-glass on the 19th is not sensible; but the removal on the 23d produced a sensible variation. With two or three exceptions, the whole list was observed on the 30th and 31st of March, therefore the mean zenith distance for each star will not be affected at Klyp Fonteyn; the other is a matter of calculation.

Assuming in the reductions of each star the line of collimation to have remained constant at each station, we have the following results:

RESULTS FOR THE AMPLITUDE OF THE ARC.

BY STARS NORTH OF THE ZENITH AT CAPE TOWN.						
Star's No. in Ast. Soc. Catalogue.	Star's Name.	At Cape Town.		At Klyp Fonteyn.		Resulting Amplitude.
		Star's Mean Zen. Dist. 1838, Jan. 0.	Error of Collim.	Star's Mean Zen. Dist. 1838, Jan. 0.	Error of Collim.	
1947	k Scorpii	N. 0° 2′ 0″·39	24″·63	S. 1° 11′ 14″·44	29″·88	1° 13′ 14″·83
1797	λ Lupi	0 47 37·01	23·61	S. 0 25 36·81	29·56	13·82
1378	(28 Crateris)	0 54 49·29	23·34	S. 0 18 24·62	29·59	13·91
1070	α Pixidis Nauticæ	1 18 52·69	22·64	N. 0 5 38·52	30·87	14·17
1969	u Scorpii	1 26 54·96	23·54	0 13 40·84	29·82	14·12
848	κ Canis Majoris	1 35 42·28	23·80	0 22 28·09	29·04	14·19
1562	i Centauri	1 41 57·00	24·02	0 28 43·21	29·51	13·79
1579	k Centauri	1 43 59·51	24·37	0 30 45·30	29·53	14·21
	Brisbane, 2566	2 28 1·63	24·06	1 14 47·78	30·13	13·85
	Brisbane, 3350	2 49 54·61	23·95	1 36 40·45	30·10	14·16
1356	19 Crateris	2 57 32·61	24·28	1 44 17·44	30·11	15·17
1866	p Scorpii	3 24 49·52	24·00	2 11 35·58	30·17	13·94
2741	α Piscis Australis (Fomalhaut)	3 26 30·08	23·74	2 13 19·22	29·27	(10·86)
2079	λ Sagittarii	3 30 9·08	24·64	2 16 54·78	28·93	14·30
1243	α Antliæ Pneumaticæ	3 40 32·29	24·07	2 27 18·15	29·64	14·14
	Brisbane, 2823	3 48 54·24	24·01	2 35 40·15	30·44	13·73
791	ζ Canis Majoris	3 55 28·47	24·42	2 42 14·70	28·72	13·77
1115	ε Pixidis Nauticæ	4 12 48·06	22·55	2 59 33·60	31·44	14·46
1774	40 Libræ	4 40 53·46	23·54	3 27 40·42	30·26	13·04
915	η Canis Majoris	4 55 44·74	23·85	3 42 30·49	30·87	14·25
869	ε Canis Majoris	N. 5 9 52·15	23·97	N. 3 56 36·75	30·23	1 13 15·40

RESULTS FOR THE AMPLITUDE OF THE ARC (*continued*).

BY STARS SOUTH OF THE ZENITH AT CAPE TOWN.						
Star's No. in Ast. Soc. Catalogue.	Star's Name.	At Cape Town.		At Klyp Fonteyn.		Resulting Amplitude.
		Star's Mean Zen. Dist. 1838, Jan. 0.	Error of Collim.	Star's Mean Zen. Dist. 1838, Jan. 0.	Error of Collim.	
1915	ε Scorpii......	S. 0° 4′ 15″·25	24″·49	S. 1° 17′ 30″·20	30″·40	1° 13′ 14″·95
699	α Columbæ....	0 14 37·13	23·95	1 27 49·24	30·28	12·11
1889	α Normæ......	0 25 23·09	23·49	1 38 38·76	30·51	15·67
2110	ε Sagittarii....	0 31 56·07	23·73	1 45 10·80	30·04	14·73
1661	c^1 Centauri.....	0 33 1·23	23·40	1 46 15·98	29·94	14·75
1061	β Pixidis Nauticæ	0 48 57·79	23·34	2 2 12·83	31·13	15·04
1604	θ Centauri.....	1 38 53·74	24·70	2 52 9·30	29·80	15·56
732	β Columbæ....	1 54 44·13	24·42	3 7 58·48	30·97	14·35
1527	ι Centauri.....	1 56 4·48	24·77	3 9 20·07	30·25	15·59
1015	q Argûs in Puppi	2 14 24·03	23·48	3 27 38·84	30·72	14·81
1299		2 20 49·86	23·93	3 34 5·14	30·25	15·28
1742	φ^2 Lupi........	2 21 1·50	23·96	3 34 16·63	30·23	15·13
1835	θ Lupi........	2 25 59·97	24·05	3 39 14·56	29·75	14·59
2101	β Telescopii....	2 52 52·14	24·23	4 6 6·47	30·12	14·33
903	π Argûs	2 53 22·16	23·93	4 6 36·78	30·01	14·62
2007	λ Scorpii......	3 3 22·89	24·14	4 16 38·20	29·24	15·31
2043	γ Telescopii....	3 3 44·00	23·95	4 16 59·08	29·39	15·08
957	c Argûs in Puppi	3 39 28·42	23·57	4 52 43·49	29·69	15·07
1821	η Lupi........	4 0 19·67	24·18	5 13 34·62	28·95	14·95
1433	u Centauri.....	S. 4 13 20·14	23·86	S. 5 26 35·15	28·57	1 13 15·01

Giving to the result from each star a weight proportional to the number of observations of that star, we have

Amplitude as deduced from the observations of 20 stars north of the zenith at Cape Town	1° 13′ 14″·163
Amplitude as deduced from the observations of 20 stars south of the zenith at Cape Town	1 13 14·847
Mean of the two	1 13 14·505

The result from No. 2741 (Fomalhaut) has been rejected, perhaps also that for No. 699 (*α Columbæ*) ought not to be retained. I am not aware of

the cause of the discrepancy, unless it be from swerving of the frame at the time of their transits, when the temperature at Klyp Fonteyn was usually 90°.

If we give to the result from each star a weight proportional to the product of the smallest number of observations of that star in either position of the sector at one station by the smallest number of observations of the same star at the other station, we find for the amplitude

By the stars north of the zenith at Cape Town	1° 13′ 14″·173
By the stars south of the zenith at Cape Town	1 13 14·961

If we give to each result a weight proportional to the quotient of the square of the number of observations of each star by twice the sum of the squares of the errors at both stations, we find for the amplitude

By the stars north of the zenith at Cape Town	1° 13′ 14″·173
By the stars south of the zenith at Cape Town	1 13 14·953

The results for the two methods may be considered identical: and the stars north of the zenith give the amplitude less by 0·″78 than the stars south of the zenith.

The number of observations at Klyp Fonteyn is 464
——— at the Guard-house 669

therefore, errors of observation are reduced to nothing.

That the change in the line of collimation on the 23d has little effect in producing the discrepancy, is shewn by the following table, where the means of the observations before that day are compared with the means of the following days. M expresses the seconds of mean zenith distance for each star by the observations preceding the 23d of June; M′ the same after the 23d of June; c and c' the errors in collimation corresponding with M and M′.

No. of A.S.C.	M	c	M′	c'	M − M′	$c - c'$
699	37″·21	24″·07	36″·94	23″·65	+ ″·27	+ ″·42
732	44·15	24·71	43·95	23·71	+ ·20	+1·00
791	28·61	24·83	27·98	23·27	+ ·63	+1·56
848	42·24	24·17	42·24	23·36	·00	+ ·81
869	52·22	24·19	51·71	23·16	+ ·51	+1·03
903	22·13	24·13	22·23	23·43	− ·10	+ ·70

No. of A.S.C.	M	c	M′	c′	M − M′	c − c′
915	44″57	23″98	45″16	23″53	− ″59	+ ″45
957	28·24	23·87	28·45	22·87	− ·21	+1·00
1015	....	....	....	....	....	....
1061	57·76	23·73	58·17	22·02	− ·41	+1·71
1070	....	....	....	....	....	....
1115	....	....	....	....	....	....
(2566)*	....	....	....	....	....	....
(2823)*	....	....	....	....	....	....
1243	32·26	24·38	32·39	23·33	− ·13	+1·05
1299	49·94	24·00	49·33	23·44	+ ·61	+ ·56
(3350)*	....	....	....	....	....	....
1356	32·68	24·56	32·64	23·33	+ ·04	+1·23
1378	49·41	23·41	48·89	23·07	+ ·52	+ ·34
1433	20·08	24·03	20·23	23·34	− ·15	+ ·69
1527	4·28	25·09	4·90	23·99	− ·62	+1·10
1562	57·03	24·17	56·88	23·29	+ ·15	+ ·88
1579	59·54	24·63	59·61	23·30	− ·07	+1·33
1604	53·61	24·95	54·11	23·78	− ·50	+1·17
1661	1·18	23·55	1·27	22·90	− ·09	+ ·65
1742	1·50	24·11	1·46	23·39	+ ·04	+ ·72
1774	53·55	23·61	53·14	23·41	+ ·41	+ ·20
1797	36·99	23·78	37·16	22·90	− ·17	+ ·88
1821	19·75	24·42	19·32	23·45	+ ·43	+ ·97
1835	60·02	24·14	59·76	23·73	+ ·26	+ ·41
1866	49·60	24·28	49·42	23·03	+ ·18	+1·25
1889	22·99	23·71	23·15	22·90	− ·16	+ ·81
1915	15·28	24·63	14·94	23·88	+ ·34	+ ·75
1947	0·54	24·80	0·02	24·07	+ ·52	+ ·73
1969	55·01	23·74	55·11	22·92	− ·10	+ ·82
2007	22·86	24·37	22·67	23·39	+ ·19	+ ·98
2043	44·04	24·16	43·44	23·17	+ ·60	+ ·99
2079	9·13	24·91	9·32	23·77	− ·19	+1·14
2101	52·06	24·49	52·05	23·43	+ ·01	+1·06
2110	55·98	24·01	55·94	22·85	+ ·04	+1·16

$$\text{Mean}\begin{cases} M - M' = +0{\cdot}07 \\ c - c' = +0{\cdot}90 \end{cases}$$

* Numerals of BRISBANE's Catalogue.

If each star had been observed an equal number of times in both positions of the arch after the 23d, the final result would have remained unaffected by $c-c'$. But 21 stars were observed once in excess with the arch east.

Suppose the average number of observations for each star to be 8 in one position, then $\left(\frac{c-c'}{16}\right)$ is the effect on the mean of each star; therefore $\left(\frac{c-c'}{16}\right) \times \frac{21}{41} = 0''{\cdot}03$ is the effect on the *final result.*

Also $(M - M') = 0''{\cdot}07$ shews, that the mean result before the object-glass was disturbed differs but little from the result of the five following days.

The next, indeed the only other explanation of this discrepancy which I can offer, is, the probable expansion of the tube at Klyp Fonteyn by the high temperature when the observations were made. The thermometer was sometimes as high as 93°, while at the Guard-house the range was between 57° and 63°.

The effect on the readings of the arch, by a disproportionate expansion* of the tube and arch, the former being in excess, is, to increase the zenith distances, consequently to produce an error like that recorded. I am farther inclined to this explanation by remarking that the amplitude from FOMALHAUT (Ast. Soc. Cat. 2741) is less by 4″ than that from the others, that star always transiting (with one exception) when the temperature of the air was above 75°, generally 90°.

On the other hand, *α Columbæ* (Ast. Soc. Cat. 699) was observed in high temperatures, yet instead of a greater amplitude it gives the nearest to FOMALHAUT. On referring to LA CAILLE's account, *Mem. de l'Acad.* 1751, page 426, I find that his southern group gave the amplitude greater by 0″·8 than the northern; this near coincidence with mine is remarkable, for he observed in the month of September under a roof where the temperature should be much the same as in his observatory in Cape Town.

If expansion of the tube be the cause, the mean between the north and south groups is as correct as if no expansion took place, a valuable property of such combinations, and is 1° 13′ 14″·56, with a probable error not exceeding 0″·03.

The axis of the sector on the corn-floor at Klyp Fonteyn was 216 feet

* The construction of the instrument offers no reason for supposing these expansions to be different.—G. B. A.

(reduced to the meridian) south of the *centre* of the foundation discovered on the 6th of April (see page 21).

The axis of the sector in the Guard-house was 45 feet on the meridian north of LA CAILLE's sector station in Mrs. DE WITT's yard.

The equivalent for 261 feet (2″·56) added to 1° 13′ 14″·56 gives 1° 13′ 17″·12 for the amplitude of LA CAILLE's arc. LA CAILLE's value is 1° 13′ 17″·33.*

When we consider that in this investigation 40 stars have been employed, on which 1133 observations have been made, it is natural to conclude that errors of observation oscillating about the true value are reduced to nothing, while errors of division, if any such exist, are reduced to a small amount.

Errors arising from the shifting of the clamp were completely checked by the micrometer readings before and after the bisection of the star.

Flexure of the telescope within 5° of the zenith is very improbable, while flexure of it from drag of the pulley-weight is eliminated in the double observation.

Observations have been made with the mural circle and sector at the Observatory, for the verification of the whole arc and the points on the limb corresponding with the zenith distances of the stars employed; but the unexpected quantity of calculation just exhibited for the position of the sector has compelled me to postpone their reduction.

Although this work does not clear up the anomaly of LA CAILLE's arc, it redounds to the credit of that justly distinguished astronomer, that with his means, and in his day, his result from 16 stars is almost identical with that from 1133 observations on 40 stars made with a powerful and celebrated instrument.

Our field of inquiry is now limited to the terrestrial measure, which every friend to science must wish to see undertaken without delay, as a portion only of a greater arc, to extend so far as to neutralise local attractions, and leave no doubt upon the true curvature of this portion of the southern hemisphere.

In the meantime, so far as the imperative duties of the Observatory will permit, the sector will be employed in the neighbourhood of the southern station, in conjunction with experiments with a portable transit instrument,

* LA CAILLE's recomputation of the celestial amplitude is 1° 13′ 17″·5.—*Fundamenta Astronomiæ*, p. 184. (Note by Professor HENDERSON.)

to ascertain how far it can be depended upon as a substitute for the sector, where local difficulties may obstruct the employment of the latter.

THOS. MACLEAR.

Royal Observatory, Cape of Good Hope,
March 1, 1839.

I have been favoured by Professor HENDERSON with the following note, relative to the latitude of LA CAILLE's station in Cape Town, as deduced from Mr. MACLEAR's sector observations.— G. B. A.

" Twelve of the stars which Mr. MACLEAR observed with the zenith sector are contained in my *Catalogue of Declinations from Observations made at the Cape;* and on reducing the declinations in that catalogue to 1838, by applying the precession and proper motion obtained from comparison with LA CAILLE's declinations, we obtain for the latitude of the station in Cape Town as under :—

Star's Name.	Star's Zenith Distance by Sector.	Star's Declination, South.	Resulting Latitude, South.
ε Canis Majoris..	N. 5° 9′ 52″·2	28° 45′ 22″·5	33° 55′ 14″·7
η Canis Majoris..	4 55 44·7	28 59 29·5	14·2
ζ Canis Majoris..	3 55 28·5	29 59 45·5	14·0
α Piscis Australis	N. 3 26 30·1	30 28 44·7	14·8
ε Scorpii.......	S. 0 4 15·2	33 59 30·9	15·7
α Columbæ.....	0 14 37·1	34 9 52·8	15·7
ε Sagittarii.....	0 31 56·1	34 27 11·3	15·2
θ Centauri.....	1 38 53·7	35 34 10·1	16·4
β Columbæ.....	1 54 44·1	35 50 1·0	16·9
ι Centauri......	1 56 4·5	35 51 20·9	16·4
λ Argûs........	2 53 22·2	36 48 38·1	15·9
λ Scorpii.......	S. 3 3 22·9	36 58 39·3	33 55 16·4

" The increase of the computed latitudes on advancing to the south is remarkable, and would appear to indicate a defect of the arch of the sector at

the rate 0″·28 for 1°. The Klyp Fonteyn observations, compared in the same manner, give a defect of 0″·19.

Adopting the mean, 0″·24, the Latitude of the Station in Cape Town is	33° 55′ 15″·62
Reduction to La Caille's Observatory	0·45
Latitude of La Caille's Observatory........	33 55 16·07

differing only 1″·04 from the result of the triangulation connecting it with the Royal Observatory (see above, page 36). This determination is likely to be more correct than that obtained from La Caille's observations, as the former depends on observations made with superior instruments."

§ 10. Observations with the Sector at Klyp Fonteyn, unreduced.

March 30th, 1838, Face of Sector East.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
791	....	9 26·9	5 16·5	9 27·0	9 26·95	+2 45 −4 10·45[a]		
810	....	8 29·4	6 0·9	8 29·2	8 29·3	+0 15 −2 28·4		
848	6 22 52	10 9·0	15 10·5	10 8·8	10 8·9	+0 20 +5 1·6[b]	29·668	74
869	31 50	10 23·5	14 10·8	10 23·5	10 23·5	+3 55 +3 21·3		
903	49 43	10 20·5	8 5·4	10 20·5	10 20·5	−4 5 −2 15·1[c]		
915	57 8	11 7·2	16 15·7	11 7·6	11 7·4	+3 40 +5 8·3		
957	7 17 34	10 24·8	6 8·2	10 24·4	10 24·6	−4 50 −4 16·4		
977	30 26	11 28·5	17 21·7	11 28·5	11 28·5	+2 45 +5 27·2	29·668	70
1007	45 47	11 24·6	7 8·1	....	....	−2 40 −4 16·5[d]		
1061	8 12 12	11 30·8	8 15·0	11 30·0	11 30·4	−2 0 −3 15·4		
1070	15 50	9 30·4	11 21·6	9 30·6	9 30·5	+0 5 +1 25·1		
1084	22 29·5	11 3·7	12 5·0	11 4·0	11 3·85	+3 50 +1 1·15		
1115	46 9·5	11 4·2	11 1·2	11 4·2	11 4·2	+3 0 −0 3·0		
(2566)*	9 8 58	11 12·8	11 21·0	11 13·2	11 13·0	+1 15 +0 8·0		
(2823)*	....	11 1·8	12 32·4	11 2·6	11 2·2	+2 35 +1 30·2		
1299	10 27 1·5	10 23·2	12 25·0	10 23·2	10 23·2	−3 35 +2 1·8		
(3350)*	24? 9	12 9·5	15 30·4	12 10·2	12 9·85	+1 35 +3 20·15		

[a] The thermometer this day was 93°. [b] Stars steady. [c] Good images. [d] Plumb-line oscillating.

* Numerals of Brisbane's Catalogue.

MARCH 30TH, 1838, FACE OF SECTOR EAST (*continued*).

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
1356	11 3 34	11 20·5	10 30·8	11 20·3	11 20·4	+1 45 −0 23·6	29·652	65·2
1378	22 55·5	10 17·6	13 29·7	10 17·8	10 17·7	−0 20 +3 12·0		
1433	57 4 or 14	9 4·4	6 20·6	9 4·2	9 4·3	−5 25 −2 17·7		
1527	12 49 1	10 10·6	11 31·3	10 10·8	10 10·7	−3 10 +1 20·6		
1562	13 14 30	10 10·8	8 19·8	10 10·6	10 10·7	+0 30 −1 24·9		
1579	20 29	10 10·6	12 3·8[e]	10 10·6	10 10·6	+0 30 +1 27·2		
1604	34 36	10 3·8	6 25·7	10 3·5	10 3·65	−2 50 −3 11·95		
1661	14 11 16	10 8·6	8 15·7	10 8·4	10 8·5	−1 45 −1 26·8		
1742?	51 40	10 1·6	4 33·7	10 1·2	10 1·4	−3 35 −5 1·7[f]		
1774	15 6 50	10 10·0	6 27·4	10 9·7	10 9·85	+3 30 −3 16·45		
1797	18 12	9 20·2	9 2·5	9 20·2	9 20·2	−0 25 −0 17·7		
1821	26 8·5	9 17·0	3 20·5	9 16·8	9 16·9	−5 10 −5 30·4		
1835	32 57	....	11 12·0	9 16·7	....	−3 40 +1 29·3		
1866	47 8	9 28·8	13 12·2	9 28·8	9 28·8	−2 10 +3 17·4[g]		
1889	58 2	9 11·2	12 11·5	9 10·8	9 11·0	−1 40 +3 0·5		
1915	16 16 54	9 16·3	5 19·3	9 15·7	9 16·0	−1 15 −3 30·7		
1947	31 22·5	10 31·8	9 11·0	10 32·2	10 32·0	−1 10 −1 21·0[h]		
2007	59 15	10 21·4	8 6·0	10 21·8	10 21·6	−4 15 −2 15·6	29·617	61·0
2043	17 15 24	10 21·8	7 20·5	10 21·4	10 21·6	−4 15 −3 1·1		
2079	32 56·5	11 1·3	15 4·4	11 1·3	11 1·3	+2 15 +4 3·1		
2101	43 12	11 4·1	9 24·3	11 4·0	11 4·05	−4 5 −1 13·75		
2110	50 18	11 4·4	11 14·9	11 4·0	11 4·2	−1 45 +0 10·7[i]		
2741	22 16 24·5	10 3·5	7 30·7	10 3·6	10 3·55	+2 15 −2 6·85		

[e] Accidentally touched the micrometer before reading off.
[f] A small image.
[g] Double; the larger, or *nf* observed.
[h] Heavy dew.
[i] A dense fog over the plain.

The Mean of 5 Altitudes of *Sirius* corrected for Index error .... = 40° 36′ 29″ at 9h 44m 19s·1 by Chron.

——— of *Spica* .... = 47 9 30   10 15 58·2 ———

By the 1st the Chronometer is fast 9m 32s·56 } on Mean Time.
By the 2d ——— 9 32·17 }

After the night's observations with the sector were finished the minute hand was put back 9^m.

MARCH 31ST, 1838, FACE OF SECTOR WEST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.		
732	....	....	19 17·6	21 26·2	....	−3 10 +2 8·6 [a]	29·614	82
791	5 40 41	12 15·7	9 11·2	12 15·4	12 15·55	+2 40 +3 4·35		
810	48 18	12 11·2	7 32·5	12 11·2	12 11·2	+0 15 +4 12·7		
869	6 18 59	10 13·8	8 14·8	10 13·4	10 13·6	+3 55 +1 32·8		
903	36 34	13 10·4	17 21·4	13 10·8	13 10·6	−4 5 −4 10·8		
915	44 17·5	10 24·3	7 6·8	10 24·5	10 24·4	+3 40 +3 17·6		
957	7 4 24	11 21·3	17 33·8	11 22·4	11 21·85	−4 50 −6 11·95		
977	17 34·5	9 28·5	5 26·4	9 28·4	9 28·45	+2 45 +4 2·05		
1007	32 40	10 12·8	16 26·5	10 13·2	10 13·0	−2 40 −6 13·5		
1015	37 37·5	10 13·2	7 21·3	10 13·4	10 13·3	−3 30 +2 26·0	29·608	75
1070	....	....	10 15·3	10 13·6	....	+0 5 −0 1·7		
1084	8 9 39	10 13·2	10 33·8	10 12·5	10 12·85	+3 50 −0 20·95		
1115	29 17	10 5·3	11 33·0	10 5·5	10 5·4	+3 0 −1 27·6		
(2566)*	56 1	10 4·4	11 21·7	10 5·2	10 4·8	+1 15 −1 16·9	29·650	71·3
(2823)*	9 24 30	9 29·7	9 26·1	9 30·1	9 29·9	+2 35 +0 3·8		
1243	....	9 22·0	6 21·0	9 21·8	9 21·9	+2 25 +3 0·9		
1299	10 8 50·5	10 17·6	10 12·8	10 17·8	10 17·7	−3 35 +0 4·9		
(3350)*	21 12·5	10 5·9	8 11·7	10 5·7	10 5·8	+1 35 +1 28·1		
1356	50 39	10 2·7	3 20·0	10 2·6	10 2·65	+1 40 +6 16·65		
1378	11 9 54	10 12·9	8 26·5	10 12·7	10 12·8	−0 20 −1 20·3 [b]	29·564	68
1527	....	10 2·8	10 12·4	10 3·0	10 2·9	−3 10 −0 9·5 [c]		
1562	13 1 39	10 7·9	4 27·5	10 7·9	10 7·9	+0 25 +5 14·4		
1579	7 30	10 7·9	1 7·4	10 7·7	10 7·8	+0 25 +9 0·4		
1604	21 29	10 7·3	15 14·9	10 7·3	10 7·3	−2 50 −5 7·6		
1661	....	9 26·7	13 11·8	9 26·8	9 26·75	−1 45 −3 19·05	29·564	65
1742	14 36 46	10 1·3	10 5·2	10 1·4	10 1·35	−3 35 −0 3·85		
1774	53 56	9 5·7	14 11·8	9 6·0	9 5·85	+3 30 −5 5·95		
1797	15 5 11	8 32·3	11 7·2	8 32·5	8 32·4	−0 25 −2 8·8		
1821	12 53	8 24·5	7 19·8	8 24·3	8 24·4	−5 15 +1 4·6		
1835	19 48	8 22·0	8 22·1	8 22·0	8 22·0	−3 40 −0 0·1 [d]		

[a] Thermometer at noon this day in the heat was 101°.
[b] The heat seems to affect the sector frame.
[c] Star leaving the field.
[d] Calm.

* Numerals of BRISBANE's Catalogue.

MARCH 31ST, 1838, FACE OF SECTOR WEST (*continued*).

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
1866	15 34(16?)	8 30·8	7 4·2	8 30·8	8 30·8	+2 10 +1 26·6		
1889	....	9 31·7	8 24·9	9 31·7	9 31·7	−1 40 +1 6·8	29·544	65
1915	16 3 51	10 20·8	7 11·2	10 20·8	10 20·8	−1 20 +3 9·6		
1947	18 19·5	9 22·0	13 1·3	9 22·2	9 22·1	−1 10 −3 13·2		
1969	30 54·5	9 12·3	12 27·3	9 11·3	9 11·8	+0 15 −3 15·5		
2007	45 3	8 4·5	12 13·3	8 4·9	8 4·7	−4 15 −4 8·6		
2043	17 2 15	8 4·9	13 0·9	8 4·6	8 4·75	−4 15 −4 30·15		
2079	20 1	8 15·3	5 32·7	8 15·3	8 15·3	+2 15 +2 16·6		
2101	30 2	8 5·8	11 14·2	8 5·8	8 5·8	−4 5 −3 8·4		
2110	37 14·5	7 30·6	9 12·2	7 31·0	7 30·8	−1 45 −1 15·4[e]		
2741	22 12 28	13 14·2	17 5·2	13 13·9	13 14·05	+2 15 −3 25·15	29·652	93·5

[e] The weather is calm and hot.

Zenith Distance of *Sirius* taken with the repeating circle.... } = 54° 19′ 55″ at 9h 54m 49s·25 by Chron.; Chron. fast 28s·53 }

——— of *Spica* .... = 42 54 20·5 at 10 2 44·25 ——— 33·67 } on Mean Time.

Mean of 5 double Altitudes of *Sirius*, taken with sextant*.. } = 56 3 8 at 10 31 37·8 ——— 33·50

——— of *Spica* ...... =108 22 3 at 10 39 47·9 ——— 27·90 }

Mean...... 30·9

I cannot explain the discrepancy in these results.

APRIL 1ST, 1838, FACE OF SECTOR EAST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.		
791	5 36 19	11 19·5	16 12·6	11 20·5	11 20·0	+2 40 +4 26·6[a]		
810	44 23	11 24·5	8 29·8	11 24·3	11 24·4	+0 15 −2 28·6		
848	6 5 59	11 32·4	16 32·2	11 32·4	11 32·4	+0 20 +4 33·8		
869	15 3·5	11 8·8	14 32·9	11 8·6	11 8·7	+3 55 +3 24·2		
903	32 41	9 28·4	7 10·4	9 28·0	9 28·2	−4 5 −2 17·8		
915	35 21	10 33·0	16 11·2	10 33·4	10 33·2	+3 40 +5 12·0		
977	7(13) 39·5	10 31·4	7 28·9	10 29·6	10 30·5	+2 50 −3 1·6		

[a] Milky atmosphere.

Overcast, accompanied with lightning to the west, north-west, and west-south-west.

* The index error of the sextant is 11′ 28″, to be subtracted from the numbers in the text. The numbers thus corrected are the *double* altitudes.

Monday, April 2d, was cloudy with rain. The weather cleared up on Tuesday, and the night was spent in examining the adjustments of the sector, principally by means of transits at the extreme ends of the arch. The collimation in right ascension appears considerable, which renders the meridian adjustment difficult. To remove the former, the wire frame was unclamped, and moved according to the indications of the successive transits; but from some stiffness in the dovetail this could not be properly accomplished, and there was not time to unscrew and examine the frame. The greater part of the night having passed in this occupation, only one star south of the zenith remained of greater zenith distance than 4°, and none to the north. Assuming the chronometer error, as obtained by the observations recorded below, to be 31ˢ·2 fast, the differences between it and the errors obtained by transits over the middle wire of the sector were finally as follows:

FACE WEST.

Æ	16ʰ 20ᵐ	Zen. Dist.	S. 1° 40′	Difference	0ˢ
	0 39		S. 1 15		0
	0 54		S. 1 10		0
	17 6		N. 0 15		0
	0 22		S. 4 0		2

The stop of the azimuth motion was clamped to this position. There not being an azimuth circle to the sector (which in field-work would be an advantage), the position face east cannot be placed, by mere mechanical means, 180° from position face west, consequently the east stop was not disturbed.

As the extreme differences in temperature in this sheltered spot are considerable, with corresponding hygrometric variations, humid in the night, dry and hot in the day, the frame not guarded as it would be under a building, it may swerve without the knowledge of the observer; to keep a check on it (so far as stars close to the zenith will be a check) in future the times of all the transits will be recorded.

The observations made before the wire frame was disturbed this night must be reduced separately from the observations to be made hereafter.

Zenith distance of *Sirius* with repeating circle	= 42° 38′ 17″	at 8h 47m 7s·5 by Chron.;	Chron. fast 29s·90	on Mean Time.
——— ———	= 46 40 1	at 9 6 32·5	——— 31·19	
Altitude of *Sirius* with sextant	= 34 55 52†	at 9 47 2·8	——— 32·78	
Zenith distance of *Spica* with repeating circle	= 37 26 22·5	at 10 19 39·5	——— 31·09	
		Mean	31·24	

APRIL 4TH, 1838, FACE OF SECTOR WEST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
699	4 44 17	10 3·6	7 10·1	10 3·3	10 3·45	−1 30 +2 27·35[a]		
732	55 38	....	17 19·5	11 8·2	....	−3 5 −6 11·3[b]	29·588	73
791	5 24 28	....	6 4·8	8 33·3	....	+2 40 +2 28·5		
848	54 5	9 25·9	6 15·8	9 26·1	9 26·0	+0 20 +3 10·2		
869	6 2 32	9 26·4	8 5·3	9 26·0	9 26·2	+3 55 +1 20·9		
903	21 33·5 or 43·5	9 25·5	13 25·7	9 27·02	9 26·25	−4 5 −3 33·45[c]		
915	27 48	....	6 19·5	9 23·4	....	+3 40 +3 3·9		
957	49 (36?)	10 5·5	16 3·5	10 6·0	10 5·75	−4 50 −5 31·75		
977	....	10 11·7	15 16·3	10 11·5	10 11·6	+2 50 −5 4·7		
1007	7 17 27	11 1·0	8 11·5	11 1·6	11 1·3	+2 45 +2 23·8		
1015	22 33	10 29·8	7 28·5	10 30·0	10 29·9	−3 30 +3 1·4		
1061	43 (44?)	10 26·0	15 30·6	10 26·0	10 26·0	−2 0 −5 4·6		
1084	53 13·5	10 23·4	11 23·2	10 23·2	10 23·3	+3 50 −0 33·9	29·604	60
1115	8 13 0·5	11 1·1	13 5·7	11 1·3	11 1·2	+3 0 −2 4·5		
(2566)*	40 3·5	11 1·7	12 24·0	11 1·7	11 1·7	+1 15 −1 22·3		
(2823)*	9 (13) 8	10 26·0	10 30·7	10 25·6	10 25·8	+2 35 −0 4·9		
1243	29 27·5	10 25·5	7 33·2	10 25·4	10 25·45	+2 25 +2 26·25		
1299	58 49	11 1·7	10 20·7	11 1·8	11 1·75	−3 35 +0 15·05		
(3350)*	....	10 29·0	9 6·8	10 28·8	10 28·9	+1 35 +1 22·1[d]		
1356	10 34 36	10 27·8	13 14·9	10 27·8	10 27·8	+1 45 −2 21·1	29·605	59
1378	54 14·5	10 25·7	9 6·1	10 25·5	10 25·6	−0 20 +1 19·5		

[a] 15s past the middle wire. [b] Thin clouds. [c] Uncertain. [d] 15s past middle wire.

† This must be diminished by 5′ 44″ for index error.— G. B. A.

* Numerals of BRISBANE's Catalogue.

April 4th, 1838, Face of Sector West (*continued*).

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	° ′ ″	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
1433	11 29 12	10 14·4	14 11·0	10 14·7	10 14·55	−5 25 −3 30·45		
1527	12 20 46	10 15·0	10 14·8	10 15·4	10 15·2	−3 10 +0 0·4		
1562	45 42	11 16·6	15 1·9	11 16·6	11 16·6	+0 30 −3 19·3	29·569	53·5
1579	51 40	11 16·6	11 14·3	11 16·6	11 16·6	+0 30 +0 2·3		
1604	13 6 18·5	11 30·9	16 32·8	11 31·2	11 31·05	−2 50 −5 1·75		
1661	42 48	10 31·9	14 14·5	10 32·1	10 32·0	−1 45 −3 16·5		
1742	14 21 45	9 15·0	9 9·2	9 15·2	9 15·1	−3 35 +0 5·9	29·582	54·5
1774	37 37·5	9 2·2	14 19·8	9 1·9	9 2·05	+3 30 −5 17·75		
1797	49 32	9 2·4	11 12·4	9 2·6	9 2·5	−0 25 −2 9·9		
1821	58 13	9 10·2	7 24·7	9 9·8	9 10·0	−5 15 +1 19·3		
1835	15 4 47	10 13·2	10 2·8	10 13·1	10 13·15	−3 40 +0 10·35		
1866	18 6	9 12·1	7 26·7	9 11·8	9 11·95	+2 10 +1 19·25		
1889	29 33	11 5·0	9 30·8	11 5·0	11 5·0	−1 40 +1 8·2		
1915	48 22	11 2·4	7 25·6	11 2·4	11 2·4	−1 20 +3 10·8	29·582	54·6
1947	16 2 49·5	11 16·3	14 27·8	11 16·4	11 16·35	−1 10 −3 11·45		
1969	15 9	11 14·0	14 30·4	11 14·0	11 14·0	+0 15 −3 16·4		
2007	31 10	11 28·2	15 23·0	11 29·0	11 28·6	−4 15 −3 28·4		
2043	47 21	11 29·0	16 9·8	11 28·9	11 28·95	−4 15 −4 14·85		
2079	17 3 53	11 4·8	8 30·0	11 5·0	11 4·9	+2 15 +2 8·9		
2101	15 6	11 18·4	14 15·8	11 18·4	11 18·4	−4 5 −2 31·4[e]		
2110	21 50·5	11 31·8	13 9·5	11 31·8	11 31·8	−1 45 −1 11·7		
2741	21 56 21·5	10 19·8	14 17·6	10 19·6	10 19·7	+2 15 −3 31·9		

[e] Good bisections throughout the night.

Mean of 5 Altitudes of *Sirius* = 34° 58′ 27″ at 9h 42m 24s·8 by Chron.; Chron. fast 30s·16 } on Mean Time.
Mean of 5 Altitudes of *Spica* = 47 22 22 at 9 48 23·4 —— 30·84
Mean ...... 9 45 —— 30·50

APRIL 5TH, 1838, FACE OF SECTOR EAST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
699	4 40 20	10 13·7	15 3·7	10 14·0	10 13·85	−1 30 +4 23·85[a]		
791	5 20 46	10 19·0	15 7·2	10 18·8	10 18·9	+2 40 +4 22·3		
810	28 40·5	10 21·2	7 31·7	10 20·8	10 21·0	+0 15 −2 23·3[b]		
848	50 15	11 27·8	16 29·7	11 28·4	11 28·1	+0 20 +5 1·6	29·680	70
869	58 54	11 22·3	15 4·5	11 22·5	11 22·4	+3 55 +3 16·1[c]		
915	6 24 34	10 21·7	15 30·6	10 22·0	10 21·85	+3 40 +5 8·75		
957	45 41	10 29·0	6 24·9	10 29·0	10 29·0	−4 50 −4 4·1[d]		
977	57 31	11 15·8	8 6·4	11 15·7	11 15·75	−2 50 −3 9·35		
1007	7 13 32·5	....	15 16·4	10 31·2	....	−2 45 +4 19·2		
1015	18 37	....	16 6·3	11 7·0	....	−3 30 +4 33·3[e]		
1061	39 52·5	10 27·5	7 16·5	10 27·5	10 27·5	−2 0 −3 11·0		
1070	....	10 33·3	12 25·1	10 33·1	10 33·2	+0 5 +1 25·9[f]		
1084	49 28	11 18·4	12 14·2	11 19·0	11 18·7	+3 50 +0 29·5		
1115	8 9 13	11 15·9	11 8·7	11 16·4	11 16·15	+3 0 −0 7·45		
(2566)*	36 15	11 7·4	11 14·4	11 7·5	11 7·45	+1 15 −0 6·95[g]		
(2823)*	9 4 28	11 16·7	13 6·0	11 16·7	11 16·7	+2 35 +1 23·3[h]		
1243	26 5	11 13·5	15 31·2	11 13·3	11 13·4	+2 25 +4 17·8[i]		
1299	55 7	11 7·6	13 15·3	11 7·3	11 7·45	−3 35 +2 7·85		
(3350)*	10 1 16·5	11 15·3	14 30·5	11 15·1	11 15·2	+1 35 +3 15·3		
1356	30 42	11 13·5	10 20·5	11 13·7	11 13 6	+1 45 −0 27·1[k]		
1433	11 25 26	10 7·8	8 0·8	10 7·0	10 7·4	−5 25 −2 6·6	29·682	58·3
1527	12 16 59	10 13·4	12 7·5	10 13·4	10 13·4	−3 10 +1 28·1		
1562	41 50	9 26·0	7 32·6	9 26·0	9 26·0	+0 30 −1 27·4		
1579	47 48	9 26·0	11 20·1	9 25·8	9 25·9	+0 30 +1 28·2[l]		
1604	13 2 28	9 29·3	6 22·8	9 29·5	9 29·4	−2 50 −3 6·6		

[a] Too much wind; plumb-line unsteady; moved the sector in azimuth by means of *α Columbæ* on the wire.
[b] Faint; 10s past middle wire.
[c] Moved the sector in azimuth.
[d] Moved the sector in azimuth.
[e] Not good.
[f] Bisected 10s past the middle wire.
[g] Moved the sector in azimuth.
[h] Moved the sector in azimuth.
[i] Leaving the field.
[k] Moved the sector in azimuth.
[l] Moved the sector in azimuth.

* Numerals of BRISBANE's Catalogue.

APRIL 5TH, 1838, FACE OF SECTOR EAST (*continued*).

No. of Ast. Soc. Cat.	Time of Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
1661	13 37 57·5	8 9 26·1[m]	7 4·6	8 9 26·2[m]	8 9 26·15	−1 45 −1 21·55[m]		
1742	14 17 54·5	10 22·0	12 22·5	10 21·9	10 21·95	−3 35 +2 0·55		
1774	33 44·5	11 11·0	7 22·8	11 11·2	11 11·1	+3 30 −3 22·3		
1797	44 44	11 24·4	11 7·9	11 24·3	11 24·35	−0 25 −0 16·45		
1821	54 24·5	12 1·4	15 11·5	12 1·4	12 1·4	−5 15 +3 10·1		
1835	15 0 56·5	12 26·7	14 29·5	12 26·3	12 26·5	−3 40 +2 3·0	29·678	55
1866	14 13·5	13 24·3	17 3·8	13 24·0	13 24·15	+2 10 +3 13·65		
1889	25 42	11 26·3	14 30·6	11 25·6	11 25·95	−1 40 +3 4·65		
1915	44 31·5	11 8·2	16 14·4	11 8·0	11 8·1	−1 20 +5 6·3		
1947	58 58·5	9 31·6	8 13·7	9 31·0	9 31·3	−1 10 −1 17·6		
1969	....	11 5·2	9 16·4	11 5·0	11 5·1	+0 15 −1 22·7		
2007	16 27 21	11 2·4	8 33·3	11 2·0	11 2·2	−4 15 −2 2·9	29·680	57·2
2741	21 52 30	11 20·4	9 13·7	11 20·2	11 20·3	+2 15 −2 6·6		

[m] The revolutions of the micrometer were registered 9 rev. The number should be 8, by comparing this with other observations of the same star.

It was stated on April 3d that only the west stop was adjusted. Having this day computed the times by chronometer when each star should transit the middle wire, the east stop was unclamped, and when a star entered the field it was kept bisected, while the sector was moved in azimuth, so that the star should transit at the specified moment. Finally no difference remained beyond the estimated error in collimation of two seconds, and the stop was then clamped. Therefore, in the reductions, the times by chronometer of the transits must be examined.

Mean of 5 Altitudes of *Spica* = 47° 44′ 24″ at $9^h\ 46^m\ 21^s$ by Chron.; Chron. fast $31^s{\cdot}11$ on Mean Time.

April 6th, 1838, Face of Sector West.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	° ′ ″	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
699	4 36 24	9 28·2	6 33·7	9 28·2	9 28·2	−1 30 +2 28·5	29·710	82
791	5 16 37	9 24·8	6 29·7	9 24·4	9 24·6	+2 40 +2 28·9		
848	46 12 or 13	10 1·3	6 25·4	10 1·5	10 1·4	+0 20 +3 10·0	29·710	75
869	54 41·5	9 28·2	8 5·2	9 27·8	9 28·0	+3 55 +1 22·8		
903	6 13 46	10 6·6	14 4·1	10 7·0	10 6·8	−4 5 −3 31·3		
915	....	9 25·7	6 16·2	9 25·5	9 25·6	+3 40 +3 9·4[a]		
957	41 45	10 10·4	16 7·8	10 11·8	10 11·1	−4 50 −5 30·7		
977	53 28	9 20·1	14 23·4	9 20·1	9 20·1	+2 50 −5 3·3		
1007	7 9 35	10 9·2	7 18·0	10 9·4	10 9·3	−2 45 +2 25·3		
1015	14 40	10 11·2	7 7·8	10 11·1	10 11·15	−3 30 +3 3·35[b]		
1061	35 53	10 9·5	15 13·8	10 9·5	10 9·5	−2 0 −5 4·3		
1070	39 13	10 3·5	10 6·0	10 3·6	10 3·55	+0 5 −0 2·45		
1084	45 (21)	10 0·5	10 33·5	10 0·5	10 0·5	+3 50 −0 33·0		
1115	8 5 9·5	10 1·7	12 5·3	10 2·5	10 2·1	+3 0 −2 3·2[c]		
(2566)*	32 12	....	12 8·0	10 21·7	....	+1 15 −1 20·3	29·688	64·5
(2823)*	9 0 27	10 5·0	10 8·0	10 5·2	10 5·1	+2 35 −0 2·9		
1243	21 38	10 6·4	7 12·0	10 6·5	10 6·45	+2 25 +2 28·45		
1299	50 37·5	10 26·0	10 9·5	10 26·2	10 26·1	+3 35 +0 16·6		
(3350)*	57 20·5	10 14·7	8 24·4	10 14·4	10 14·55	+1 35 +1 24·15		
1356	10 26 45	10 14·4	12 32·9	10 14·4	10 14·4	+1 45 −2 18·5		
1378	46 23	10 4·2	8 17·0	10 4·0	10 4·1	−0 20 +1 21·1		
1433	11 21 18	10 20·6	14 16·6	10 20·7	10 20·65	−5 25 −3 29·95		
1527	12 12 54	10 17·0	10 16·0	10 17·0	10 17·0	−3 10 +0 1·0		
1562	37 41	10 21·4	14 3·3	10 21·5	10 21·45	+0 30 +3 15·85		
1579	43 50	10 21·5	10 16·5	10 21·5	10 21·5	+0 30 +0 5·0		
1604	58 26	10 32·5	15 31·0	10 32·6	10 32·55	−2 50 −4 32·45		
1661	13 34 57	10 32·6	14 11·5	10 32·6	10 32·6	−1 45 −3 12·9	29·635	59
1742	14 13 53·5	11 10·0	11 0·7	11 9·7	11 9·85	−3 35 +0 9·15		
1774	29 46·5	10 18·0	15 31·4	10 17·5	10 17·75	+3 30 −5 13·65		
1797	41 41	10 33·6	13 6·4	11 0·0	10 33·8	−0 25 −2 6·6		
1821	50 21	11 25·0	10 3·4	11 25·1	11 25·05	−5 15 −1 21·65		

[a] 20ˢ past middle wire. [b] Warm evening. [c] Becoming cool.

* Numerals of Brisbane's Catalogue.

APRIL 6TH, 1838, FACE OF SECTOR WEST (*continued*).

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
1835	14 56 55	10 29·4	10 17·2	10 29·6	10 29·5	−3 40 +0 12·3		
1889	15 21 42	10 15·9	9 3·0	10 15·3	10 15·6	−1 40 +1 12·6		
1915	41 31	10 21·8	7 6·4	10 21·0	10 21·4	−1 20 +3 15·0	29·603	57·5
1947	54 59	10 21·7	13 28·8	10 21·4	10 21·55	−1 10 −3 7·25		
1969	16 7 18·5	10 20·9	14 0·2	10 20·8	10 20·85	+0 15 −3 13·35		
2007	23 18·5	10 31·2	14 23·7	10 31·2	10 31·2	−4 15 −3 26·5		
2043	39 29·5	10 31·2	15 9·7	10 31·4	10 31·3	−4 15 −4 12·4		
2079	56 3	9 25·5	7 13·8	9 25·5	9 25·5	+2 15 +2 11·7		
2101	17 7 14·5	10 6·3	12 33·9	10 6·5	10 6·4	−4 5 −2 27·5		
2110	13 59	10 6·0	11 13·3	10 5·2	10 5·6	−1 45 −1 7·7[d]	29·614	56

[d] The air feels very cold.

Bad images throughout the night.

Mean of 5 Altitudes of *Sirius* with sextant .... } = $(57° 19′ 4″ − 11′ 10″) \times \frac{1}{2} = 28° 33′ 57″$ at 10h 5m 0s·13 by Chron.

——— *Spica* $= (106\ 46\ 15 - 11\ 10) \times \frac{1}{2} = 53\ 17\ 33$ at 10 11 52·8 ———

Chronometer fast on mean time, by *Sirius* 32s·47, by *Spica* 32s·06.

APRIL 7, 1838, FACE OF SECTOR EAST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
869	5 50 50	10 3·2	14 11·1	10 30·4	10 30·3	+3 55 +3 14·8[a]		
903	6 9 55	10 16·2	8 10·5	10 15·0	10 15·6	−4 5 −2 5·1	29·586	83
957	37 (12)	10 15·3	8 24·2	10 15·3	10 15·3	−4 50 −1 25·1		
977	49 37·5	10 14·0	7 2·8	10 14·8	10 14·4	+2 50 −3 11·6		
1007	7 5 42·5	9 32·3	14 15·0	9 32·4	9 32·35	−2 45 +4 16·65		
1015	10 48·5	9 31·2	14 26·0	9 30·6	9 30·9	−3 30 +4 29·1		
1061	32 2·5	9 28·5	6 18·2	9 29·3	9 28·9	−2 0 −3 10·7		
1084	41 31·5	9 24·0	10 17·1	9 24·3	9 24·15	+3 50 +0 26·95		
(2566)*	8 28 19·5	9 20·1	9 24·4	9 20·4	9 20·25	+1 15 +0 4·15		

[a] Thin clouds clearing off.

* Numeral of BRISBANE's Catalogue.

April 7, 1838, Face of Sector East (*continued*).

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
(2823)*	8 56 35	9 30·5	11 19·3	9 30·7	9 30·6	+2 35 +1 22·7	29·583	72·5
1243	9 17 (46)	9 11·0	13 30·7	9 11·0	9 11·0	+2 25 +4 19·7 [b]		
(3350)*	58 28	9 10·3	12 26·7	9 10·5	9 10·4	+1 35 +3 16·3		
1356	10 22 53	9 2·4	8 9·3	9 2·7	9 2·55	+1 45 −0 27·25		
1378	42 29·5	9 1·0	12 11·7	9 1·2	9 1·1	−0 20 +3 10·6		
1433	11 17 25·5	9 1·5	6 27·7	9 2·0	9 1·75	−5 25 −2 8·05	29·574	69
1527	12 9 1	9 20·0	11 12·8	9 20·0	9 20·0	−3 10 +1 26·8		
1562	33 57·5	10 14·8	8 21·7	10 15·4	10 15·1	+0 30 −1 27·4		
1579	40 58	10 15·4	12 9·5	10 15·5	10 15·45	+0 30 +1 28·05		
1604	54 33·5	....	7 30·8	11 5·2	....	−2 50 −3 8·4	29·539	66
1661	13 31 4	11 17·5	9 28·8	11 18·0	11 17·75	−1 45 −1 22·95		
1742	14 10 0	11 4·4	13 3·7	11 4·0	11 4·2	−3 35 +1 33·5		
1774	25 (53)	10 32·1	7 7·8	10 32·0	10 32·05	+3 30 −3 24·25		
1797	....	10 17·9	10 0·5	10 18·0	10 17·95	−0 25 −0 17·45 [c]		
1821	46 29	10 29·6	14 5·7	10 29·6	10 29·6	−5 15 +3 10·1		
1835	....	10 20·6	12 23·4	10 21·4	10 21·0	−3 40 +2 2·4 [d]		
1889	....	12 23·5	15 27·2	12 23·0	12 23·25	−1 40 +3 3·95 [e]		

[b] The second of time uncertain. [c] Wind and clouds rising.
[d] Bisected 15ˢ past middle wire. [e] Bisected 16ˢ past middle wire; cloudy; the sky was soon totally overcast.

* Numerals of Brisbane's Catalogue.

Four Readings for Zenith Distances of *Sirius* with the Repeating Circle as follows:

At 8ʰ 40ᵐ 5ˢ by Chron.	0° 0′ 9″	gave	44° 43′ 24″ at 8ʰ 41ᵐ 28ˢ by Chronometer.
8 42 51 ——	89 26 57		
8 47 21·5 ——	89 26 57	gave	46 9 45·7 at 8 48 23·25 ——
8 49 25 ——	181 46 28·3		

Chronometer fast on mean time, by the first pair 30ˢ·41, by the second pair 30ˢ·83.

Sunday, April 8, was cloudy; also part of Monday.

APRIL 9TH, 1838, FACE OF SECTOR EAST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
848	5 34 30	11 29·9	16 31·7	11 29·9	11 29·9	+0 20 +5 1·8	29·620	78
869	42 57·5	10 14·3	13 31·4	10 14·3	10 14·3	+3 55 +3 17·1		
903	6 2 2	8 13·7	6 9·3	8 14·2	8 13·95	−4 5 −2 4·65		
957	30 1	8 28·5	4 24·6	8 28·7	8 28·6	−4 50 −4 4·0	29·616	74
977 ?	40 29	....	12 2·3	10 14·0	....	+2 50 +1 22·3		
1007	57 51·5	9 32·5	14 16·5	9 32·5	9 32·5	−2 45 +4 18·0		
1015	7 0 0	9 31·3	14 28·5	9 30·7	9 31·0	−3 30 +4 31·5		
1061	24 10	9 32·3	6 24·5	9 31·9	9 32·1	−2 0 −3 7·6		
1070	27 29·5	9 19·6	11 10·0	9 19·5	9 19·55	+0 5 +1 24·45		
1084	33 40	11 15·4	12 11·6	11 15·5	11 15·45	+3 50 +0 30·15	29·625	72·5
1115	53 26	11 17·8	11 8·2	11 17·8	11 17·8	+3 0 −0 9·6		
(2566)*	....	11 4·0	11 8·7	11 4·2	11 4·1	+1 15 +0 4·6 [a]		
1579	12 32 5·5	10 12·8	12 6·3	10 11·5	10 12·15	+0 30 +1 28·15 [b]		
1604	46 42	9 4·7	5 30·6	9 4·8	9 4·75	−2 50 −3 8·15		

[a] 15ˢ past meridian. [b] Dense clouds.

* Numeral of BRISBANE's Catalogue.

At 8^h M.T. dense clouds ascended from the north with strong wind, indicating an approaching storm. About midnight the sky again became clear, but about 13^h it was entirely overcast. The lunar eclipse consequently could not be observed.

APRIL 10TH, 1838, FACE OF SECTOR EAST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
699	4 20 44·5	8 31·2	13 17·5	8 31·2	8 31·2	−1 30 +4 20·3		
732	32 10	9 1·0	4 17·2	9 0·4	9 0·7	−3 5 −4 17·5	29·620	87
791	5 0 58	10 4·6	14 25·8	10 4·8	10 4·7	+2 40 +4 21·1		
848	30 34	9 30·2	14 30·8	9 30·2	9 30·2	+0 20 +5 0·6		
869	39 2·5	10 13·8	13 29·2	10 13·8	10 13·8	+3 55 +3 15·4		
903	58 6	9 32·6	7 28·0	9 31·5	9 32·05	−4 5 −2 4·05[a]		
915	....	....	15 14·6	10 12·0	....	+3 40 +5 2·6[b]		
957	6 25 24[c]	9 17·4	7 27·4	9 17·8	9 17·6	−4 50 −1 24·2		
977	36 33	20 6·4	16 29·6	20 6·6	20 6·5	+2 50 −3 10·9[d]		
1007	53 55	10 21·6	15 4·7	10 21·7	10 21·65	−2 45 +4 16·05		
1015	59 1	10 3·8	14 32·6	10 3·5	10 3·65	−3 30 +4 28·95[e]		
1061	7 20 14	10 2·2	6 25·3	10 2·0	10 2·1	−2 0 −3 10·8	29·632	74·2
1070	23 34·5	9 26·7	11 19·0	9 26·8	9 26·75	+0 5 +1 26·25		
1084	29 44	10 19·1	11 14·2	10 19·7	10 19·4	+3 50 +0 28·8		
1115	49 31	10 18·7	10 9·8	10 19·2	10 18·95	+3 0 −0 9·15		
(2566)*	8 16 33	10 17·5	10 21·8	10 17·8	10 17·65	+1 15 +0 4·15		
(2823)*	44 47·5	10 27·0	12 16·2	10 27·4	10 27·2	+2 35 +1 23·0	29·628	71·6
1243	9 5 58	10 29·5	15 14·7	10 29·6	10 29·55	+2 25 +4 19·15		
1299	35 17	10 11·4	12 18·6	10 11·2	10 11·3	−3 35 +2 7·3		
(3350)*	41 41	10 23·3	14 3·4	10 23·3	10 23·3	+1 35 +3 14·1		
1356	10 11 5	10 23·6	9 29·2	10 24·0	10 23·8	+1 45 −0 28·6		
1378	30 43	10 17·8	13 28·8	10 17·8	10 17·8	−0 20 +3 11·0		
1433	11 5 47·5[f]	10 9·2	8 1·8	10 9·4	10 9·3	−5 25 −2 7·5	29·620	68
1527	57 14	10 8·3	12 1·0	10 7·9	10 8·1	−3 10 +1 26·9		
1562	12 22 10	10 27·3	8 33·9	10 27·2	10 27·25	+0 30 −1 27·35		
1579	28 9·5	10 27·2	12 21·1	10 27·3	10 27·25	+0 30 +1 27·85	29·602	68
1604	42 46·5	10 17·0	7 7·9	10 17·2	10 17·1	−2 50 −3 9·2		
1661	13 19 7	10 12·2	8 24·2	10 12·2	10 12·2	−1 45 −1 22·0		

[a] Not sufficient illumination. [b] 25^s past middle wire. [c] $6^h\ 26^m\ 24^s$?

[d] Touched the arch with my hand. [e] Upper dot not attended to. [f] Should be 37^s·5.

* Numerals of BRISBANE's Catalogue.

APRIL 10TH, 1838, FACE OF SECTOR EAST (*continued*).

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
1742	13 58 12·5	10 8·3	12 7·0	10 8·5	10 8·4	−3 35 +1 32·6	29·602	66
1774	14 14 7	11 0·9	7 10·7	11 1·1	11 1·0	+3 30 −3 24·3		
1797	26 0	10 21·3	10 3·8	10 21·2	10 21·25	−0 25 −0 17·45		
1821	34 40·5	10 23·7	13 32·5	10 24·1	10 23·9	−5 15 +3 8·6		
1835	41 14	10 26·9	12 28·8	10 27·0	10 26·95	−3 40 +2 1·85		
1866	54 34·5	11 5·1	14 17·8	11 6·0	11 5·55	+2 10 +3 12·25		
1889	15 6 1	10 20·5	13 24·5	10 20·9	10 20·7	−1 40 +3 3·8		
1915	24 51·5	10 12·2	15 17·2	10 12·2	10 12·2	−1 20 +5 5·0		
1947	39 18	10 14·5	8 29·5	10 14·5	10 14·5	−1 10 −1 19·0[g]		
1969	51 37	10 15·5	8 23·4	10 15·3	10 15·4	+0 15 −1 26·0		
2007	16 7 38	10 12·6	8 7·7	10 12·6	10 12·6	−4 15 −2 4·9		
2043	23 49	10 12·6	7 21·0	10 12·4	10 12·5	−4 15 −2 25·5	29·602	64·5
2079	40 23·5	10 17·8	14 16·3	10 17·6	10 17·7	+2 15 +3 32·6		
2101	51 32·5	10 12·2	9 7·8	10 12·6	10 12·4	−4 5 −1 4·6		
2110	58 18	10 11·7	10 27·0	10 12·0	10 11·85	−1 45 −0 15·15		
2741	21 32 52·5	10 12·8	8 4·8	10 11·5	10 12·15	+2 15 −2 7·35		

[g] North wind springing up.

Zenith Distance of *Sirius* by repeating circle = 54° 22′ 26″ at 8h 26m 33s·835 by chron. Error + 32s·27

——— *Antares* ——— = 54 36 59·7 at 10 52 45·665 ——— Error + 32·21

Chronometer fast on mean time, by *Sirius* 32s·27, by *Antares* 32s·21.

APRIL 11TH, 1838, FACE OF SECTOR WEST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
732	....	12 5·4	18 13·0	12 5·6	12 5·5	−3 5 −6 7·5[a]		
791	....	12 4·3	9 7·8	12 3·8	12 4·05	+2 40 +2 30·25[b]		
848	5 26 33	12 1·5	8 25·4	12 1·7	12 1·6	+0 20 +3 10·2		
869	35 4	11 22·2	9 32·9	11 21·8	11 22·0	+3 55 +1 23·1[c]		
903	54 4	10 10·8	14 7·7	10 10·8	10 10·8	−4 5 −3 30·9	29·600	82
915	6 0 25	9 23·8	6 15·8	9 23·8	9 23·8	+3 40 +3 8·0		
957	....	10 10·6	16 5·9	10 10·3	10 10·45	−4 50 −5 29·45[d]		
977	....	9 21·8	14 27·4	9 21·8	9 21·8	+2 50 −5 5·6[e]		
1007	49 53	9 33·0	7 9·0	9 33·2	9 33·1	−2 45 +2 24·1	29·600	75
1015	54 59	9 26·8	6 25·8	9 27·3	9 27·05	−3 30 +3 1·25		
1061	7 16 12·5	9 31·8	15 3·7	9 31·0	9 31·4	−2 0 −5 6·3[f]		
1070	19 33·5	9 29·8	10 0·6	9 29·7	9 29·75	+0 5 −0 4·85		
1084	25 45	9 28·2	10 30·4	9 28·0	9 28·1	+3 50 −1 2·3		
1115	45 51·5	9 29·2	12 1·4	9 29·2	9 29·2	+3 0 −2 6·2		
(2566)*	8 12 32·5	9 33·5	11 21·7	9 33·5	9 33·5	+1 15 −1 22·2		
(2823)*	40 48	9 31·1	10 1·3	9 30·7	9 30·9	+2 35 −0 4·4		
1243	9 2 0	9 31·3	7 5·4	9 31·2	9 31·35	+2 25 −2 25·85	29·606	67·5
1356	10 7 6	10 9·9	12 30·5	10 9·7	10 9·8	+1 45 −2 20·7		
1378	26 43	10 32·2	9 14·4	10 32·5	10 32·35	−0 20 +1 17·95		
1433	11 1 35	10 30·2	14 28·8	10 30·4	10 30·3	−5 25 −3 32·5		
1527	53 9	10 27·1	10 27·0	10 26·9	10 27·0	−3 10 −0 0·0		
1562	12 18 12	10 26·4	14 11·0	10 26·8	10 26·6	+0 30 −3 18·4		
1579	24 9·5	10 26·8	10 28·1	10 26·4	10 26·6	+0 30 −0 1·5		
1604	38 46	11 15·5	16 15·3	11 15·7	11 15·6	−2 50 −4 33·7		
1661	13 15 16	9 14·0	12 28·7	9 14·0	9 14·0	−1 45 −3 14·7		

[a] 20s past middle wire. [b] 20s past middle wire. [c] The second at transit probably incorrect.
[d] 10s past middle wire. [e] 10s past middle wire. [f] Bad images.

* Numerals of BRISBANE's Catalogue.

A dense fog and strong north wind sprung up at 14^h M. T.

Zenith Distance of *Sirius* with repeating circle $54° 12' 5''\cdot5$ at $9^h\ 11^m\ 0^s\cdot165$ by chronometer.

Chronometer fast on mean time $31^s\cdot79$.

The 12th, 13th, and 14th, were rainy or cloudy.

APRIL 15TH, 1838, FACE OF SECTOR WEST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
732	4 12 24·5	11 5·3	17 16·2	11 5·3	11 5·3	−3 5 −6 10·9[a]		
791	41 21·5	8 13·9	5 17·2	8 14·4	8 14·15	+2 40 +2 30·95		
848	5 10 54	9 2·4	5 26·4	9 2·6	9 2·5	+0 20 +3 10·1		
869	5 19 27	8 27·6	7 6·4	9 27·8	9 27·7	+3 55 +1 21·3[b]		
903	38 17	9 16·2	13 13·0	9 16·2	9 16·2	−4 5 −3 30·8		
915	44 48·5	8 26·0	5 17·3	8 26·4	8 26·2	+3 40 +3 8·9	29·734	66·2
957	6 6 15	9 29·3	15 28·8	9 29·5	9 29·4	−4 50 −5 33·4		
977	18 12·5	....	14 9·9	9 4·3	....	+2 50 −5 5·6		
1007	....	9 25·0	6 1·2	9 25·2	9 25·1	−2 45 +3 23·9		
1061	7 1 (29)	9 19·4	14 25·7	9 19·2	9 19·3	−2 0 −5 6·4		
1070	3 52·5	....	9 10·8	9 5·2	....	+0 5 −0 5·6[c]		
1084	10 9	9 11·3	10 13·7	9 11·4	9 11·35	+3 50 +1 2·35		
1115	29 54	9 8·7	11 14·5	9 8·5	9 8·6	+3 0 −2 5·9		
(2566)*	56 54	9 16·2	11 5·3	9 16·0	9 16·1	+1 15 −1 23·2		
(2823)*	8 5 11	9 8·7	9 14·7	9 8·8	9 8·75	+2 35 −0 5·95	29·744	60·5
1243	46 21	9 4·2	6 12·3	9 4·0	9 4·1	+2 25 +2 25·8		
1299	9 15 (31)	10 29·2	10 15·5	10 29·4	10 29·3	−3 35 +0 13·8		
(3350)*	21 2·5	9 21·1	7 33·6	9 21·3	9 21·2	+1 35 +1 21·6		
1356	51 27·5	9 25·2	12 12·4	9 25·2	9 25·2	+1 45 −2 21·2		
1378	10 11 0·5	10 2·0	8 18·6	10 2·0	10 2·0	−0 20 +1 17·4		
1433	....	10 7·4	14 6·7	10 7·5	10 7·45	−5 25 −3 33·25[d]		
1562	12 2 32	10 10·1	13 30·0	10 10·1	10 10·1	+0 30 −3 19·9		
1579	8 30	10 10·1	10 7·8	10 10·0	10 10·05	+0 30 +0 2·25	29·716	59
1604	23 0	11 0·4	16 2·8	11 1·2	11 0·8	−2 50 −5 2·0[e]		
1661	59 33	10 27·8	14 11·3	10 28·4	10 28·1	−1 45 −3 17·2		
1742	13 38 26	10 13·7	10 8·4	10 13·3	10 13·5	−3 35 +0 5·1		
1774	54 32	9 11·7	14 29·0	9 11·7	9 11·7	+3 30 −5 17·3		
1797	14 6 19·5	10 0·5	12 11·2	10 0·5	10 0·5	−0 25 −2 10·7		
1821	14 51	10 4·3	8 21·2	10 4·5	10 4·4	−5 15 +1 17·2		
1835	21 28	10 0·0	9 24·5	10 0·0	10 0·0	−3 40 +0 9·5		

[a] Wind. [b] Crabby images. [c] Bad images. [d] Observed 10s past middle wire. [e] Images blotchy.

* Numerals of BRISBANE's Catalogue.

April 15th, 1838, Face of Sector West (*continued*).

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
1866	14 34 57·5	8 32·8	7 14·1	8 33·4	8 33·1	+2 10 +1 19·0		
1889	46 18	9 5·7	7 30·2	9 5·5	9 5·6	−1 40 +1 9·4		
1947	15 19 36	9 7·8	13 19·1	10 7·8	10 7·8	−1 10 −3 11·3	29·665	58
1969	31 58	10 6·4	13 22·8	10 6·2	10 6·3	+0 15 −3 16·5		
2007	48 50	11 1·7	14 30·8	11 1·3	11 1·5	−4 15 −3 29·3		
2043	16 4 1	11 1·3	15 17·7	11 1·5	11 1·4	−4 15 −4 16·3		
2079	20 45	11 7·0	8 30·8	11 7·0	11 7·0	+2 15 +2 10·2		
2101	31 46·5	10 30·2	13 26·2	10 30·0	10 30·1	−4 5 −2 30·1		
2110	38 35·5	10 33·7	12 10·8	10 33·7	10 33·7	−1 45 −1 11·1		
2741	21 13 14	10 20·5	14 15·7	10 20·1	10 20·3	+2 15 −3 29·4		

The sector frame had slightly swerved in position, produced apparently by the effect of the late rains on the corn-floor.

Altitude of *Antares* with sextant from 5 observations $= 43° 19' 21''$ at $11^h\ 11^m\ 14^s{\cdot}2$ by chron.
Chronometer fast on mean time $34^s{\cdot}56$.

April 16th, 1838, Face of Sector East.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
971	4 37 28·5	9 17·2	14 5·3	9 17·2	9 17·2	+2 40 +4 22·1	29·518	82
869	5 15 36	9 33·8	13 15·6	9 34·0	9 33·9	+3 55 +3 15·7		
903	34 26·5	9 9·5	7 4·6	9 9·5	9 9·5	−4 5 −2 4·9 [b]		
915	40 56	9 6·8	14 8·7	9 7·0	9 6·9	+3 40 +5 1·8	29·500	75
957	6 2 25	9 4·6	4 31·3	9 4·2	9 4·4	−4 50 −4 7·1		
977	13 3·5	9 31·9	11 20·2	9 31·9	9 31·9	+2 50 +1 22·3 [c]		
1007	30 17·5	10 2·7	14 19·0	10 2·7	10 2·7	−2 45 +4 16·3		
1015	35 23	10 3·7	14 32·5	10 3·7	10 3·7	−3 30 +4 28·8		
1061	....	....	6 24·8	9 33·8	....	−2 0 −3 9 0 [d]		
1070	7 0 0·5	10 4·8	11 29·4	10 4·8	10 4·8	+0 5 +1 24·6		
1084	6 16 5	10 1·3	10 29·5	10 1·3	10 1·3	+3 50 +0 28·2		

[a] Beautiful. [b] Good. [c] Upper dot bisected ? [d] 20s past middle wire.

APRIL 16TH, 1838, FACE OF SECTOR EAST (*continued*).

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
1115	7 26 1	10 1·7	9 27·4	10 2·3	10 2·0	+3 0 −0 8·6		
(2566)*	53 1	9 28·7	9 33·2	9 29·5	9 29·1	+1 15 +0 4·1	29·472	65·5
(2823)*	8 21 18	9 28·4	11 17·8	9 28·5	9 28·45	+2 35 +1 23·35		
1243	42 28	....	14 10·6	9 25·5	....	+2 25 +4 19·1		
1299	9 11 38·5	9 7·6	11 14·5	9 7·6	9 7·6	−3 35 +2 6·9		
(3350)*	18 9·5	9 12·5	12 27·0	9 12·5	9 12·5	+1 35 +3 14·5		
1356	47 40	9 10·4	8 14·8	9 10·0	9 10·2	+1 45 −0 29·4		
1378	10 7 9	9 13·3	12 22·8	9 13·3	9 13·3	−0 20 +3 9·5		
1527	11 33 36	9 7·2	10 32·8	9 7·0	9 7·1	−3 10 +1 25·7		
1562	58 38	9 18·3	7 22·7	9 17·8	9 18·05	+0 30 −1 29·35[e]		
1579	12 4 37	9 17·8	11 10·7	9 17·8	9 17·8	+0 30 +1 26·9[f]		
1604	19 9	9 6·9	5 31·4	9 6·9	9 6·9	−2 50 −3 9·5[g]		
1661	55 41	9 5·3	7 14·8	9 5·2	9 5·25	−1 45 −1 24·45		
1742	13 34 34	9 6·8	11 4·8	9 6·6	9 6·7	−3 35 +1 32·1	29·460	58·2
1774	50 38·5	9 23·3	5 32·8	9 22·9	9 23·1	+3 20 −3 24·3[h]		
1821	14 11 0	8 19·5	11 28·1	8 19·7	8 19·6	−5 15 +3 8·5		
1835	17 36	8 23·8	10 25·4	8 24·2	8 24·0	−3 40 +2 1·4	29·466	59
1866	31 4·5	....	13 18·1	10 5·9	....	+2 10 +3 12·2		
1889	42 25·5	10 6·5	13 8·9	10 6·0	10 6·25	−1 40 +3 2·65		
1915	15 1 15	10 3·4	15 8·0	10 3·8	10 3·6	−1 20 +5 4·4		
1947	15 42·5	9 29·0	8 10·5	9 29·0	9 29·0	−1 10 −1 18·5		
1969	28 4	10 9·4	8 18·5	10 9·0	10 9·2	+0 15 −1 24·7		
2007	43 58·5	10 10·0	8 6·6	10 10·0	10 10·0	−4 15 −2 3·4		
2043	16 0 9	10 10·0	7 20·7	10 10·2	10 10·1	−4 15 −2 23·4	29·453	58·8
2079	17 52·5	11 0·5	15 1·2	11 0·8	11 0·65	+2 15 +4 0·55		
2101	27 54·5	11 3·8	10 0·0	11 3·6	11 3·7	−4 5 −1 3·7		
2110	34 43·0	10 32·3	11 14·0	10 32·1	10 32·2	−1 45 +0 15·8		
2741	21 9 21·5	10 31·0	8 24·6	10 31·0	10 31·0	+2 15 −2 6·4[i]		

[e] Bad light. [f] Crabby. [g] Blotchy. [h] Light air. [i] Very bad image.

* Numerals of BRISBANE's Catalogue.

Altitude of *Antares* with sextant from 5 observations = 43° 54′ 14″ at 11h 10m 4s·6 by chronometer.

Chronometer fast on mean time 34s·42.

Rather a heavy fall of rain in the night of the 17th.

APRIL 18TH, 1838, FACE OF SECTOR WEST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
(2566)*	7 45 1	10 17·4	12 8·8	10 17·4	10 17·4	+1 15 −1 25·4		
(2823)*	....	9 30·3	10 2·3	9 30·3	9 30·3	+2 35 +0 6·0		
1243	8 34 23	9 22·6	6 31·3	9 22·8	9 22·7	+2 25 +2 25·4	29·828	58·6
1299	9 3 54	10 14·5	10 1·5	10 14·4	10 14·45	−3 35 +0 12·95		
1356	39 31·5	10 2·0	12 24·5	10 2·0	10 2·0	+1 45 −2 22·5		
1378	59 12·5	10 4·4	8 21·0	10 4·3	10 4·35	−0 20 +1 17·35		
1433	10 34 18·5	10 21·3	14 22·3	10 24·5	10 22·9	−5 25 −3 33·4 [a]		
1527	11 25 51	10 13·0	10 15·0	10 13·0	10 13·0	−3 10 −0 2·0		
1562	50 41	10 0·0	13 22·0	10 0·2	10 0·1	+0 30 −3 21·9 [b]		
1579	56 39·5	10 1·4	9 33·6	10 1·2	10 1·3	+0 30 +0 1·7		
1604	12 11 22·5	10 13·4	15 16·0	10 13·0	10 13·2	−2 50 −5 2·8		
1661	47 50·5	10 12·2	13 29·4	10 12·3	10 12·25	−1 45 −3 17·15	29·815	53·5
1742	13 26 54·5	10 19·6	10 1·52	10 19·4	10 19·5	−3 35 +0 4·3		
1774	42 31·0	9 17·5	15 1·7	9 17·7	9 17·6	+3 30 −5 18·1		
1797	54 32	9 28·8	12 5·6	9 28·8	9 28·8	−0 25 −2 10·8	29·815	52·2
1821	14 3 22	10 23·4	9 7·2	10 25·0	10 24·2	−5 15 +1 17·0		
1835	9 52	10 22·2	10 13·8	10 22·2	10 22·2	−3 40 +0 8·4		
1866	22 59·5	9 33·5	8 14·7	9 33·5	9 33·5	+2 10 +1 18·8		
1915	53 23	10 29·0	7 18·7	10 29·0	10 29·0	−1 20 +3 10·3		
1947	15 7 50	10 30·7	14 6·7	10 30·7	10 30·7	−1 10 −3 10·0		
1969	20 7	11 12·5	14 29·5	11 12·3	11 12·4	+0 15 −3 17·1		
2007	36 17·5	12 19·2	16 14·3	12 19·3	12 19·25	−4 15 −3 29·05		
2043	52 27·5	12 19·3	17 0·3	12 19·5	12 19·4	−4 15 −4 14·9	29·781	52
2079	16 8 48·5	12 16·8	10 8·2	12 16·8	12 16·8	+2 15 +2 8·6		
2101	20 12·5	11 0·7	13 31·1	11 1·2	11 0·95	−4 5 −2 30·15		
2110	26 52	11 9·7	12 21·0	11 9·6	11 9·65	−1 45 −1 11·35 [c]		
2741	21 1 15	10 20·2	14 19·7	10 19·8	10 20·0	+2 15 −3 33·7 [d]	29·852	69

[a] A probable mistake in reading off one of the dots.

[b] Upper dot not previously examined.

[c] The stars have been steady this night.

[d] Bad image.

* Numerals of BRISBANE's Catalogue.

After the transit of No. 869 the instrument was shifted in azimuth, as indicated by the next following stars. It appears to have been disturbed during my absence yesterday.

APRIL 19TH, 1838, FACE OF SECTOR EAST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
869	5 3 38	11 22·0	15 4·0	11 22·2	11 22·1	+3 55 +3 15·9[a]		
903	22 51	11 4·2	8 32·9	11 4·2	11 4·2	−4 5 −2 5·3[b]	29·750	71
915	28 59·5	10 24·8	15 24·8	10 25·0	10 24·9	+3 40 +4 33·9[c]		
957	51 52	10 21·7	6 15·8	10 21·7	10 21·7	−4 50 −4 5·9		
977	6 2 26	10 26·0	7 14·4	10 25·0	10 25·5	+2 50 −3 11·1		
1007	18 37·5	10 24·2	15 7·7	10 24·0	10 24·1	−2 45 +4 17·6		
1061	....	9 27·8	6 15·5	9 27·8	9 27·8	−2 0 −3 12·3	29·750	65
1070	....	9 21·0	11 10·0	9 20·8	9 20·9	+0 5 +1 23·1[d]		
1084	....	9 30·4	10 22·4	9 30·4	9 30·4	+3 50 +0 26·0		
1115	....	9 26·3	9 15·7	9 26·4	9 26·35	+3 0 −0 10·65		
(2823)*	....	9 20·4	11 5·9	9 20·6	9 20·5	+2 35 +1 19·4[e]		
1243	....	9 26·2	14 8·3	9 26·6	9 26·4	+2 25 +4 15·9		
1356	....	10 5·3	9 10·0	10 5·3	10 5·3	+1 45 −0 29·3		
1378	....	11 1·6	14 10·8	11 2·0	11 1·8	−0 20 +3 9·0[f]		
1579	....	11 0·4	12 26·3	11 0·5	11 0·45	+0 30 +1 25·85		
1604	....	10 31·7	7 21·3	10 31·7	10 31·7	−2 50 −3 10·4		
1666	....	10 28·4	9 4·8	10 28·4	10 28·4	−1 45 −1 23·6		
1742	13 22 55·5	10 12·6	12 9·9	10 12·4	10 12·5	−3 35 +1 31·4		
1774	38 43	10 3·7	6 11·8	10 2·8	10 3·25	+3 30 −3 25·45[g]		
1797	....	9 29·4	9 10·8	9 29·0	9 29·2	−0 25 −0 18·4[h]		
1821	59 35·5	9 33·7	13 7·8	9 33·7	9 33·7	−5 15 +3 8·1	29·682	55·5
1835	14 5 57·5	9 26·4	11 27·8	9 26·0	9 26·2	−3 40 +2 1·6		
1866	....	10 3·7	13 14·7	10 3·7	10 3·7	+2 10 +3 11·0		
1889	30 42	10 5·3	13 7·6	10 5·1	10 5·2	−1 40 +3 2·4		
1947	15 14 58	10 5·3	8 20·8	10 5·8	10 5·55	−1 10 −1 18·75		
1969	16 16	10 19·8	8 28·4	10 20·0	10 19·9	+0 15 −1 25·5		
2007	48 24	10 15·2	8 12·5	10 15·4	10 15·3	−4 15 +2 2·8		
2043	48 34	10 15·4	7 25·8	10 15·8	10 15·6	−4 15 −2 23·8		
2079	16 14 59·5	10 21·0	14 21·0	10 21·0	10 21·0	+2 15 +4 0·0		
2101	20 0	10 19·4	9 17·5	10 19·4	10 19·4	−4 5 −1 1·9	29·652	53
2110	23 2·5	10 11·0	10 27·2	10 10·8	10 10·9	−1 45 +0 16·3		
2741	20 57 26·5	10 5·6	8 4·7	10 6·3	10 5·95	+2 15 −2 1·25[i]		

[a] Striæ (Cirri). [b] Indications of strong wind. [c] Table mountain is visible, capped with cloud.
[d] Chronometer is employed with the repeating circle. [e] Very faint. [f] Cloudy.
[g] Bad. [h] Leaving the field. [i] Bad image, flickering.

* Numeral of BRISBANE's Catalogue.

April 20th, 1838, Face of Sector West.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev pts.	° ′ rev. pts.	in.	°
699	....	9 10·7	6 13·1	9 10·7	9 10·7	−1 30 +2 31·6[a]		
732	....	9 10·5	15 20·3	9 10·5	9 10·5	−3 5 −6 9·8	29·653	79
791	4 21 35·5	9 15·7	6 20·0	9 15·7	9 15·7	+2 40 +2 29·7	29·653	77·5
869	....	9 25·8	8 2·8	9 25·6	9 25·7	+3 55 +1 22·9[b]		
903	5 18 39·5	11 16·7	15 15·2	11 16·7	11 16·7	−4 5 −3 32·5[c]		
915	25 1	11 1·0	7 29·2	11 1·0	11 1·0	+3 40 +3 5·8		
957?	....	11 1·4	14 18·3	11 2·0	11 1·7	−4 50 −3 16·6		
977	58 26	9 18·4	14 23·0	9 18·0	9 18·2	+2 50 −5 4·8		
1007	6 14 29·5	10 24·6	7 33·5	10 24·8	10 24·7	−2 45 +2 25·2[d]		
1015	19 35	10 27·4	7 26·2	10 27·7	10 27·55	−3 30 +3 1·35	29·653	68
1070	....	....	10 32·4	10 29·2	....	+0 5 −0 3·2[e]		
1084	50 19·5	10 27·4	11 28·6	10 27·2	10 27·3	+3 50 −1 1·3		
1115	7 10 7·5	10 21·5	12 27·8	10 22·3	10 21·9	+3 0 −2 5·9		
(2566)*	37 9	10 24·0	12 12·6	10 24·2	10 24·1	+1 15 −1 22·5		
(2823)*	8 5 24·5	10 24·8	10 31·8	10 24·8	10 24·8	+2 35 −0 7·0		
1243	26 35·5	10 24·7	7 33·8	10 24·7	10 24·7	+2 25 +2 24·9		
1299	55 52	12 9·1	11 31·7	12 9·7	12 9·4	−3 35 +0 11·7		
(3350)*	....	11 7·8	9 21·9	11 7·6	11 7·7	+1 35 +1 19·8		
1356	9 31 42	11 2·8	13 26·5	11 3·0	11 2·9	+1 45 −2 23·6		
1378	51 28	10 26·3	9 9·2	10 26·0	10 26·15	−0 20 +1 16·95	29·630	61
1433	10 26 9·5	....	14 8·0	10 7·6	....	−5 25 −4 0·4		
1527	11 17 49·5	9 27·2	9 29·3	9 27·0	9 27·1	−3 10 −0 2·2		
1562	42 46	9 26·1	13 13·3	9 25·9	9 26·0	+0 30 −3 21·3		
1579	48 46	9 25·9	9 26·2	9 25·6	9 25·75	+0 30 −0 0·45		
1604	12 3 21	10 8·2	15 11·1	10 8·8	10 8·5	−2 50 −5 2·6[f]		
1661	39 52	10 7·3	13 23·7	10 7·1	10 7·2	−1 45 −3 16·5		
1742	13 18 47	10 17·4	10 12·8	10 17·4	10 17·4	−3 35 +0 4·6		
1774	34 44·5	10 1·6	15 20·9	10 2·0	10 1·8	+3 30 −5 19·1		
1821	54 16·5	10 19·5	9 2·2	10 20·0	10 19·75	−5 15 +1 17·55		
1835	14 1 51	10 23·4	10 15·1	10 23·2	10 23·3	−3 40 +0 8·2		

[a] 20s past middle wire, invisible on entering the field. [b] Wind. [c] Wind. [d] Calm.
[e] 20s past middle wire. [f] Bad images, brilliant sky.

* Numerals of Brisbane's Catalogue.

April 20th, 1838, Face of Sector West (*continued*).

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
1866	14 15 12·5	10 4·5	8 18·9	10 4·5	10 4·5	+2 10 +1 19·6		
1889	26 37	10 20·6	9 10·8	10 20·6	10 20·6	−1 40 +1 9·8		
1915	45 26·5	11 4·0	7 26·7	11 3·6	11 3·8	−1 20 +3 11·1		
1947	59 53·5	11 3·8	14 14·5	11 4·0	11 3·9	−1 10 −3 10·6	29·560	54
1969	15 12 15	10 32·2	14 15·4	10 31·8	10 32·0	+0 15 −3 17·4		
2007	28 13	11 18·4	15 13·5	11 18·5	11 18·45	−4 15 −3 29·05		
2043	44 23	11 18·5	16 0·0	11 18·3	11 18·4	−4 15 −4 15·6		
2079	16 1 0	11 5·0	8 29·4	11 5·0	11 5·0	+2 15 +2 9·6		
2101	12 8·5	11 30·0	14 27·1	11 30·5	11 30·25	−4 5 −2 30·85		
2110	18 55	12 1·5	13 11·8	12 1·5	12 1·5	−1 45 −1 10·3		
2741	20 53 27	10 17·3	14 13·2	10 16·9	10 17·1	+2 15 −3 30·1		

Zenith Distance of *Antares* with repeating circle = 44° 3′ 53″ at $11^h\ 3^m\ 59^s{\cdot}67$ by chronometer.
Chronometer fast on mean time $32^s{\cdot}13$.

April 21st, 1838, Face of Sector East.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
699	3 37 32	14 15·0	19 4·3	14 14·8	14 14·9	−1 30 +4 23·4	29·550	80
732	48 59	14 11·9	9 31·4	14 12·3	14 12·1	−3 5 −4 14·7		
869	4 55 44·5	12 30·0	16 16·8	12 30·2	12 30·1	+3 55 +3 20·7		
903	....	12 3·8	10 0·1	12 4·8	12 4·3	−4 5 −2 4·2 [a]		
915	5 6 5	11 18·0	16 17·8	11 18·0	11 18·0	+3 40 +4 33·8		
957	42 55·5	11 8·4	7 5·0	11 8·6	11 8·5	−4 50 −4 3·5		
977	54 33	11 6·7	7 30·8	11 6·2	11 6·45	+2 50 −3 9·65	29·523	75·5
1007	....	10 6·4	14 24·5	10 6·4	10 6·4	−2 45 +4 18·1		
1015	6 15 50	9 23·5	14 19·8	9 23·5	9 23·5	−3 30 +4 30·3		
1061	39 2	10 7·5	6 30·8	10 8·1	10 7·8	−2 0 −3 11·0 [b]		
1084	46 27	9 16·9	10 8·4	9 16·8	9 16·85	+3 50 +0 25·55		

[a] 20s past middle wire. [b] Much lightning.

APRIL 21ST 1838, FACE OF SECTOR EAST (*continued*).

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
1115	7 6 14	9 1·9	8 25·8	9 2·1	9 2·0	+3 0 −0 10·2		
(2566)*	....	9 16·8	9 20·2	9 16·8	9 16·8	+1 15 +0 3·4[c]		
(2823)*	8 1 31	9 23·4	11 10·4	9 23·4	9 23·4	+2 35 +1 21·0		
1243	22 42	9 21·0	14 3·4	9 20·8	9 20·9	+2 25 +4 16·5		
1299	52 6	....	12 18·8	10 12·0	....	−3 35 +2 6·8[d]		
(3350)*	58 26	11 0·4	14 13·2	11 0·5	11 0·45	+1 35 +3 12·75		
1356	9 27 49·5	10 8·7	9 13·5	10 8·3	10 8·5	+1 45 −0 29·0		
1378	47 28·5	10 7·8	13 17·5	10 8·0	10 7·9	−0 20 +3 9·6	29·482	64·2
1433	10 22 29·5	9 33·7	7 24·6	9 33·5	9 33·6	−5 25 −2 9·0[e]		
1527	11 14 1·5	9 31·3	11 23·3	9 31·4	9 31·35	−3 10 +1 25·95		
1562	38 56·5	8 32·7	7 4·8	8 33·1	8 32·9	+0 30 −1 28·1	29·468	63
1579	44 55	8 33·2	10 26·6	8 33·1	8 33·15	+0 30 +1 27·45		
1661	12 36 4	....	7 29·4	9 18·8	....	−1 45 −1 23·4		
1742	13 15 3	9 11·3	11 9·3	9 11·1	9 11·2	−3 35 +1 32·1	29·450	61·2
1774	30 49	9 32·5	6 8·7	9 32·0	9 32·25	+3 30 −3 23·55		
1797	42 47	10 3·8	9 19·1	10 3·8	10 3·8	−0 25 −0 18·7		
1821	51 33·5	9 27·4	13 2·5	9 27·6	9 27·5	−5 15 +3 9·0[f]		
1835	58 4·5	9 22·2	11 23·9	9 22·0	9 22·1	−3 40 +2 1·8		
1866	14 11 20	9 18·7	12 30·4	9 18·5	9 18·6	+2 10 +3 11·8	29·436	60·5
1889	22 49	9 18·8	12 22·2	9 18·6	9 18·7	−1 40 +3 3·5		
1915	41 38·5	9 20·4	14 26·0	9 20·4	9 20·4	−1 20 +5 5·6		
1947	56 5	9 21·5	8 5·0	9 21·7	9 21·6	−1 10 −1 16·6		
1969	15 8 23·5	9 27·4	8 3·5	9 26·5	9 26·95	+0 15 −1 23·45[g]		
2007	24 28·5	9 19·0	7 16·7	9 19·0	9 19·0	−4 15 −2 2·3		
2043	40 39	9 19·0	6 30·3	9 18·8	9 18·9	−4 15 −2 22·6	29·418	59·5
2079	57 7·5	10 7·5	14 8·5	10 7·6	10 7·55	+2 15 +4 0·95		
2101	16 8 24·5	10 33·6	9 31·5	10 33·4	10 33·5	−4 5 −1 2·0		
2110	15 6·5	10 19·8	11 3·5	10 19·4	10 19·6	−1 45 +0 17·9		
2741	20 49 34	8 19·3	6 16·3	8 18·9	8 19·1	+2 15 −2 2·8	29·504	74

[c] Cloudy at transit; bisected 10^{s} after.
[d] Accidentally touched the lower microscope.
[e] Smaller image; cloudy; detached clouds.
[f] Good observation.
[g] Stars' images much agitated.

* Numerals of BRISBANE's Catalogue.

There was no observation for the Chronometer Error until the 24th, when it was found to be $33^{\mathrm{s}}{\cdot}03$ fast on mean time.

APRIL 22D, 1838, FACE OF SECTOR EAST.

Observations for determining the "Run of the Micrometer."

Arch to the Left.

Points of Limb.	Micrometer Readings.	Difference.
° ′	rev. pts.	rev. pts.
0 10	4 3·2	8 31·1
5	13 0·3	8 30·9
10	4 3·4	
20	4 2·8	17 28·5
10	21 31·3	17 28·6
20	4 2·7	
30	4 1·4	17 28·2
20	21 29·6	17 28·6
30	4 1·0	
40	4 32·7	17 29·2
30	22 27·9	17 29·5
40	4 32·4	
50	4 2·4	17 28·3
40	21 30·7	17 28·5
50	4 2·2	
1 0	4 1·3	17 28·4
50	21 29·7	17 27·9
1 0	4 1·8	
Arch	to the	Right.
0 0	4 10·7	17 29·5
10	22 6·2	17 29·4
0	4 10·8	
10	4 9·3	17 29·5
20	22 4·8	17 29·5
10	4 9·3	
20	4 12·7	17 29·4
30	22 8·1	17 29·0
20	4 13·1	
30	4 11·8	17 28·7
40	22 6·5	17 29·3
30	4 11·2	

Arch to the Right.

Points of Limb.	Micrometer Readings.	Difference.
° ′	rev. pts.	rev. pts.
0 40	4 10·2	17 28·4
50	22 4·6	17 28·4
40	4 10·2	
50	4 7·1	17 29·3
1 0	22 2·4	17 29·1
50	4 7·3	
Arch	to the	Left.
4 10	4 5·7	17 29·0
4 0	22 0·7	17 29·0
4 10	4 5·7	
4 20	4 2·6	17 29·1
4 10	21 31·7	17 29·5
4 20	4 2·2	
4 30	4 8·7	17 28·3
4 20	22 3·0	17 28·2
4 30	4 8·8	
Arch	to the	Right.
4 0	4 25·0	17 29·8
4 10	22 20·8	17 28·7
4 0	4 26·1	
4 10	4 19·2	17 28·6
4 20	22 13·8	17 28·5
4 10	4 19·3	
4 20	4 17·4	17 29·3
4 30	22 12·7	17 29·1
4 20	4 17·6	

Mean temperature (indicated by the thermometers hanging from the sector frame) during the examination = 79°·5.

The observations commenced at 9h A.M.

Arranged in order from Left to Right, the Value of one Revolution in Terms of the Arch, is

° ′	″
4 30	
	= 33·649
4 20	
	= 33·590
4 10	
	= 33·608
4 0	
1 0	
	= 33·655
0 50	
	= 33·641
0 40	
	= 33·588
0 30	
	= 33·641
0 20	
	= 33·633
0 10	
	= 33·663
0 5	
0 0	
	= 33·583
0 10	
	= 33·580
0 20	
	= 33·597
0 30	
	= 33·608
0 40	
	= 33·641
0 50	
	= 33·597
1 0	
4 0	
	= 33·594
4 10	
	= 33·633
4 20	
	= 33·597
4 30	

The arithmetical mean is 33″·616.

In the above calculation the mean of the results for the direct and retrograde motion of the motion of the screw over each interval is taken.

The screw head is divided into 34 parts, and (adding together all the results for all the measured arcs) 10620·15″ of these parts correspond to 10500″ of the arch. Therefore $\frac{34 \times 10500''}{10620 \cdot 15} = 33''\cdot6153$ for the value of one revolution.

KLYP FONTEYN.

Table for Converting the Readings of the Micrometer into Minutes and Seconds of the Arch.

Div.	0^r	1^r	2^r	3^r	4^r	5^r	6^r
0	0″	33″·615	1′ 7″·231	1′ 40″·846	2′ 14″·461	2′ 48″·077	3′ 21″·692
1	0·989	34·604	1 8·220	1 41·835	2 15·450	2 49·066	3 22·681
2	1·977	35·592	1 9·208	1 42·823	2 16·438	2 50·054	3 23·669
3	2·966	36·581	1 10·197	1 43·812	2 17·427	2 51·043	3 24·658
4	3·955	37·570	1 11·186	1 44·801	2 18·416	2 52·032	3 25·647
5	4·943	38·559	1 12·175	1 45·790	2 19·405	2 53·020	3 26·635
6	5·932	39·547	1 13·163	1 46·778	2 20·393	2 54·009	3 27·624
7	6·921	40·536	1 14·152	1 47·767	2 21·382	2 54·998	3 28·613
8	7·909	41·525	1 15·141	1 48·756	2 22·371	2 55·986	3 29·601
9	8·898	42·513	1 16·129	1 49·744	2 23·359	2 56·975	3 30·590
10	9·887	43·502	1 17·118	1 50·733	2 24·348	2 57·964	3 31·579
11	10·876	44·491	1 18·107	1 51·722	2 25·337	2 58·953	3 32·568
12	11·864	45·479	1 19·095	1 52·710	2 26·325	2 59·941	3 33·556
13	12·853	46·468	1 20·084	1 53·699	2 27·314	3 0·930	3 34·545
14	13·842	47·457	1 21·073	1 54·688	2 28·303	3 1·919	3 35·534
15	14·830	48·446	1 22·061	1 55·676	2 29·291	3 2·907	3 36·522
16	15·819	49·434	1 23·050	1 56·665	2 30·280	3 3·896	3 37·511
17	16·808	50·423	1 24·039	1 57·654	2 31·269	3 4·885	3 38·499
18	17·796	51·411	1 25·027	1 58·642	2 32·257	3 5·873	3 39·488
19	18·785	52·400	1 26·016	1 59·631	2 33·246	3 6·862	3 40·477
20	19·774	53·389	1 27·005	2 0·620	2 34·235	3 7·851	3 41·466
21	20·762	54·377	1 27·993	2 1·608	2 35·223	3 8·839	3 42·454
22	21·751	55·366	1 28·982	2 2·597	2 36·212	3 9·828	3 43·443
23	22·740	56·355	1 29·971	2 3·586	2 37·201	3 10·817	3 44·432
24	23·728	57·343	1 30·959	2 4·574	2 38·189	3 11·805	3 45·420
25	24·717	58·332	1 31·948	2 5·563	2 39·178	3 12·794	3 46·409
26	25·706	59·321	1 32·937	2 6·552	2 40·167	3 13·783	3 47·398
27	26·695	1 0·310	1 33·926	2 7·541	2 41·156	3 14·772	3 48·387
28	27·683	1 1·298	1 34·914	2 8·529	2 42·144	3 15·760	3 49·375
29	28·672	1 2·287	1 35·903	2 9·518	2 43·133	3 16·749	3 50·364
30	29·661	1 3·276	1 36·892	2 10·507	2 44·122	3 17·738	3 51·353
31	30·649	1 4·264	1 37·880	2 11·495	2 45·110	3 18·726	3 52·341
32	31·638	1 5·253	1 38·869	2 12·484	2 46·099	3 19·715	3 53·330
33	32·627	1 6·242	1 39·858	2 13·473	2 47·088	3 20·704	3 54·319
34	33·615	1 7·231	1 40·846	2 14·461	2 48·077	3 21·692	3 55·307

§ 11. Observations with the Sector at Cape Town, unreduced.

May 12th, 1838, Face of Sector West.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
1115	9 2 55	10 15·0	6 19·1	10 14·8	10 14·9	+4 0 +3 29·8		
(2566)*	30 1·5	9 32·8	14 22·1	9 33·0	9 32·9	+2 30 −4 23·2		
(2823)*	58 19	10 2·8	13 9·1	10 3·0	10 2·9	+3 50 −3 6·2		
1243	10 19 33·5	10 3·4	10 13·0	10 3·6	10 3·5	+3 40 −0 9·5[a]		
1299	....	9 16·7	12 3·1	9 16·7	9 16·7	−2 20 −2 20·4		
(3350)*	....	....	10 12·7	8 33·2	....	+2 50 −1 13·5		
1433	12 19 35	9 26·9	7 31·8	9 27·0	9 26·95	−4 15 +1 29·15[b]		
1527	13 11 18·5	9 18·4	12 22·2	9 18·4	9 18·4	−1 55 −3 3·8[c]		
1562	36 17	9 14·4	7 6·1	9 14·4	9 14·4	+1 40 +2 8·3		
1579	42 17	9 14·4	3 17·9	9 14·3	9 14·35	+1 40 +5 30·45		
1604	56 57·5	10 1·2	9 7·2	10 1·2	10 1·2	−1 40 +0 28·0		
1661	14 33 33·5	10 1·6	7 21·8	10 1·5	10 1·55	−0 35 +2 13·75		
1742	15 12 36·5	9 33·0	12 29·3	9 32·8	9 32·9	−2 20 −2 30·4		
1774	28 29	9 19·1	9 6·5	9 18·9	9 19·0	+4 40 +0 12·5		
1797	40 27	9 19·7	14 33·2	9 19·7	9 19·7	+0 50 −5 13·5		
1821	49 11	9 24·2	11 8·0	9 24·2	9 24·2	−4 0 −1 17·8		
1835	....	9 13·9	12 5·7	9 14·0	9 13·95	−2 25 −2 25·75		
1866	....	9 10·4	10 26·2	9 11·0	9 10·7	+3 25 −1 15·5		
1889	16 20 34	....	11 7·3	9 17·7	....	−0 25 −1 23·6		
1915	39 27	9 19·6	9 8·3	9 19·6	9 19·6	−0 5 +0 11·3		
1947	....	9 21·4	15 31·4	9 21·4	9 21·4	+0 5 −6 10·0		
1969	17 6 16·5	9 19·7	7 5·4	9 19·9	9 19·8	+1 25 +2 14·4		
2007	22 21·5	9 14·5	7 11·4	9 14·1	9 14·3	−3 5 +2 2·9		
2043	38 35	9 14·2	7 31·6	9 14·2	9 14·2	−3 5 +1 16·6		
2079	55 8	8 23·3	9 14·1	8 23·4	8 23·35	+3 30 −0 24·75		
2101	18 6 24	9 7·0	6 5·8	9 7·0	9 7·0	−2 55 +3 1·2		
2110	13 8·5	9 3·4	13 12·4	9 3·2	9 3·3	−0 30 −4 9·1[d]		

[a] The second of transit is doubtful. [b] Perfectly calm. [c] Fine definition.

[d] The upper dot was not examined before bisection; afterwards the error for this star was found to be $0^{rev}{\cdot}3 = 0''{\cdot}297$.

* Numerals of Brisbane's Catalogue.

The barometer is by Dollond: its indications are lower by $0^{in}{\cdot}051$ than those of the standard barometer at the Observatory.

May 13th, 1838, Face of Sector East.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
848	6 43 37	8 23·2	10 15·7	8 23·0	8 23·1	+1 35 +1 26·6		
869	52 8·5	9 5·2	9 11·0	9 5·1	9 5·15	+5 10 +0 5·85		
903	7 11 11·5	9 29·8	13 11·8	9 29·4	9 29·6	−2 55 +3 16·2		
957	39 11·5	9 10·2	10 26·5	9 10·2	9 10·2	−3 40 +1 16·3		
1007	8 7 9	10 8·6	11 15·0	10 8·6	10 8·6	−1 30 +1 6·4		
1015	....	10 8·5	11 26·2	10 8·5	10 8·5	−2 15 +1 17·7	30·142	
1061	33 32·5	10 14·0	12 21·1	10 14·2	10 14·1	−0 50 +2 7·0		
1070	36 54	10 23·7	8 32·9	10 24·0	10 23·85	+1 20 −1 24·95		
1084	43 7	11 27·0	9 4·3	11 27·0	11 27·0	+5 5 −2 22·7		
1115	9 2 56	9 8·4	14 14·7	9 8·6	9 8·5	+4 10 +5 6·2		
(2566)*	30 1·5	....	5 31·3	9 7·5	....	+2 30 −3 10·2		
(2823)*	58 21·5	9 9·3	7 15·0	9 9·3	9 9·3	+3 50 −1 28·3		
1243	10 19 35·5	9 7·2	10 9·3	9 7·3	9 7·25	+3 40 +1 2·05		
1299	48 56·5	8 24·1	7 13·7	8 23·5	8 23·8	−2 20 −1 10·1		
(3350)*	55 22·5	9 7·7	9 5·6	9 7·5	9 7·6	+2 50 −0 2·0		
1356	11 24 52	9 14·2	14 1·0	9 14·5	9 14·35	+2 55 +4 20·65		
1378	44 33	9 14·5	9 6·0	9 14·1	9 14·3	+0 55 −0 8·3		
1433	12 19 30·5	9 30·8	13 3·4	9 30·3	9 30·55	−4 15 +3 6·85		
1579	13 42 15	10 17·8	17 25·5	10 17·8	10 17·8	+1 40 +7 7·7[a]		
1604	56 58·5	10 1·7	12 7·5	10 1·7	10 1·7	−1 40 +2 5·8		
1661	14 33 33·5	10 2·7	13 27·2	10 2·7	10 2·7	−0 35 +3 24·5[b]	30·131	
1742	15 12 (36 ?)	9 7·0	7 22·7	9 7·0	9 7·0	−2 20 −1 18·3		
1774	28 26	9 25·7	11 13·5	9 26·0	9 25·85	+4 40 +1 21·65		
1797	40 26	9 30·8	5 29·3	9 30·8	9 30·8	+0 50 −4 1·5		
1835	55 46	9 15·5	8 0·4	9 15·3	9 15·4	−2 25 −1 15·0		
1866	16 9 2	9 26·0	9 21·5	9 25·8	9 25·9	+3 25 −0 4·4		
1889	20 35	9 13·4	9 1·2	9 13·3	9 13·35	−0 25 −0 12·15		
1915	39 26·5	9 19·5	11 8·2	9 19·4	9 19·45	−0 5 +1 22·75		
1947	53 55·5	9 11·1	13 10·2	9 11·3	9 11·2	0 0 +3 33·0[c]		
1969	17 6 16·5	9 21·8	13 12·7	9 21·8	9 21·8	+1 25 +3 24·9		
2007	22 24	9 16·7	12 30·2	9 16·3	9 16·5	−3 5 +3 13·7	30·140	
2043	38 37	9 16·3	12 9·5	9 16·5	9 16·4	−3 5 +2 27·1		
2079	54 6	9 32·4	10 20·2	9 32·5	9 32·45	+3 30 +0 21·75		
2101	18 6 27	9 13·5	4 29·4	9 12·7	9 13·1	−2 50 −4 17·7		
2110	13 9	8 33·8	6 2·6	8 33·6	8 33·7	−0 30 −2 31·1		

[a] Moved the sector a little eastward in azimuth at 13^h 36^m sidereal time. [b] Bad images. [c] Bad images.

* Numerals of Brisbane's Catalogue.

On the whole, this, though clear, was a bad observing night; the images indifferent and torch-like.

MAY 15TH, 1838, FACE OF SECTOR WEST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
(3350)*	10 56 13	9 32·8	11 13·2	9 32·8	9 32·8	+2 50 −1 14·4		
1356	11 25 43	10 9·2	7 0·7	10 9·5	10 9·35	+2 55 +3 8·65		
1378	45 22·5	10 24·0	12 9·5	10 23·8	10 23·9	+0 55 −1 19·6		
1433	12 20 21	9 29·1	8 1·0	9 29·1	9 29·1	−4 15 +1 28·1	29·924	
1562	13 37 7·5	9 9·8	7 2·8	9 10·0	9 9·9	+1 40 +2 7·1		
1579	43 6·5	9 10·0	3 15·2	9 9·8	9 9·9	+1 40 +5 28·7		
1604	57 45	9 8·1	8 16·2	9 8·1	9 8·1	−1 40 +0 25·9		
1661	14 34 21·5	9 2·7	6 24·2	9 2·7	9 2·7	−0 35 +2 12·5		
1797	15 39 21	9 19·45	9 7·4	9 19·2	9 19·33	+4 40 +0 11·93[a]		
1866	16 9 55	8 20·4	10 3·5	8 20·4	8 20·4	+3 25 −1 17·1		
1889	21 22·5	9 8·2	10 32·4	9 8·2	9 8·2	−0 25 −1 24·2[b]		
1915	40 14	9 9·4	8 33·4	9 9·3	9 9·35	−0 5 +0 9·95		
1947	54 54	9 26·75	7 6·6	9 26·40	9 26·58	0 0 +2 19·98		
1969	17 7 6	9 24·5	7 10·4	9 24·4	9 24·45	+1 25 +2 14·05		
2007	23 8	9 33·7	7 31·7	9 33·7	9 33·7	−3 5 +2 2·0		
2043	....	9 33·7	8 17·3	9 33·5	9 33·6	−3 5 +1 16·3		
2079	....	9 33·1	10 25·7	9 33·3	9 33·2	−3 5 −0 26·5		
2101	18 7 (9·5)?	10 3·2	15 32·7	10 3·2	10 3·2	−2 50 −5 29·5		
2110	13 57	10 7·6	14 17·5	10 7·6	10 7·6	−0 30 −4 9·9		
2741	22 49 10·5	10 32·0	8 27·3	10 31·8	10 31·9	+3 25 +2 4·6	30·015	

[a] The micrometer was moved twice for each dot-bisection, and the mean taken. [b] Cloudy.

* Numeral of BRISBANE's Catalogue.

The stars have been difficult of bisection to-night; bad and unsteady images.

The day was warm and lowering.

The chronometer was allowed to run down in my absence, but was set in motion several hours before the observations commenced.

MAY 16TH, 1838, FACE OF SECTOR EAST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
699	....	8 33·2	10 13·3	8 33·2	8 33·2	−0 15 +1 14·1 [a]		
1562	13 36 56	9 25·3	4 12·4	9 25·3	9 25·3	+1 45 −5 12·9		
1579	42 55	9 25·3	8 0·4	9 25·1	9 25·2	+1 45 −1 24·8		
1604	57 36	9 20·4	11 27·3	9 20·4	9 20·4	−1 40 +2 6·9	30·138	62
1661	14 34 11·5	9 23·3	13 14·6	9 23·5	9 23·4	−0 35 +3 25·2		

[a] Rain in the morning.

Now totally overcast. A warm cloudy day with occasional separations near the zenith.

MAY 17TH, 1838, FACE OF SECTOR WEST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line. on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
869	6 52 9	10 31·0	12 3·4	10 30·8	10 30·9	+5 10 −1 6·5		
903	7 11 0·5	11 28·1	9 23·6	11 28·0	11 28·05	−2 55 +2 4·45	30·185	61·5
915	17 31	....	9 7·6	9 19·4	....	+4 55 +0 11·8		
957	39 14	9 26·1	9 22·3	9 26·3	9 26·2	−3 40 +0 3·9 [a]		
1115	9 2 52	9 3·0	5 8·4	9 3·0	9 3·0	+4 10 +3 28·6		
(2566)*	29 59·5	9 6·2	13 30·3	9 6·4	9 6·3	+2 30 −4 24·0	30·185	61·2
(2823)*	58 18·5	9 5·0	12 11·6	9 4·8	9 4·9	+3 50 −3 6·7		
1243	10 19 32	9 3·5	9 14·5	9 3·5	9 3·5	+3 40 −0 11·0		
1299	48 54·5	9 2·4	11 25·3	9 2·2	9 2·3	−2 20 −2 23·0		
1356	11 24 50	8 18·6	5 11·9	8 18·6	8 18·6	+2 55 +3 6·7	30·185	61·2
1378	44 30	8 15·4	10 1·3	8 15·4	8 15·4	+0 55 −1 19·9 [b]		
1562	13 36 14·5	9 3·3	15 28·8	9 3·3	9 3·3	+1 45 −6 25·5		
1604	56 52·5	9 0·8	8 9·2	9 0·6	9 0·7	−1 40 +0 25·5		
1661	14 33 29	8 26·1	6 15·0	8 25·9	8 26·0	−0 35 +2 11·0		
1742	15 12 30·5	8 32·7	11 31·5	8 32·7	8 32·7	−2 20 −2 32·8 [c]		
1774	28 28·5	8 16·2	8 5·2	8 16·0	8 16·1	+4 40 +0 10·9 [d]		
1797	40 23·5	8 12·3	13 25·2	8 12·4	8 12·35	+0 50 −5 12·85		
1821	49 2·5	8 19·8	10 7·4	8 19·8	8 19·8	−4 0 −1 21·6		

[a] Clouds coming over from the south.
[b] Hazy atmosphere.
[c] Hazy atmosphere.
[d] Bad images.

* Numerals of BRISBANE's Catalogue.

MAY 17TH, 1838, FACE OF SECTOR WEST (*continued*).

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
1835	15 55 38	8 10·0	11 4·3	8 10·0	8 10·0	−2 25 −2 28·3		
1866	....	7 26·7	9 9·8	7 26·7	7 26·7	+3 25 −1 17·1 [a]		
1889	16 20 29	8 9·2	10 0·8	8 9·3	8 9·25	−0 25 −1 25·55		
1915	39 21·5	8 12·3	8 3·2	8 12·3	8 12·3	−0 5 +0 9·1		
1947	53 51	8 19·6	6 0·7	8 19·6	8 19·6	0 0 +2 18·9		
1969	....	8 16·9	15 2·9	8 16·9	8 16·9	+1 30 −6 20·0		
2007	17 22 15·5	8 23·3	6 23·3	8 23·4	8 23·35	−3 5 +2 0·05		
2043	38 28·5	8 23·4	7 9·5	8 23·4	8 23·4	−3 5 +1 13·9 [b]		
2079	55 6·5	8 7·9	9 0·2	8 7·8	8 7·85	+3 30 −0 26·35		
2101	18 6 18·5	8 28·6	14 25·8	8 28·7	8 28·65	−2 50 −5 31·15		
2110	13 4·5	8 17·6	12 28·2	8 17·6	8 17·6	−0 30 −4 10·6	30·150	61

[a] 15s past the middle wire. [b] Bad definition.

A dense fog came on and continued the remainder of the night.

MAY 18TH, 1838, FACE OF SECTOR EAST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
1661	14 33 33	....	12 13·3	8 25·0	....	−0 35 +3 22·3		
1742	15 12 (41?)	8 24·2	7 4·8	8 24·2	8 24·2	−2 20 −1 19·4 [a]		
1774	28 12·5	8 33·6	10 22·6	8 33·6	8 33·6	+4 40 +1 23·0 [b]		
1797	40 23·5	9 7·0	5 6·6	9 7·0	9 7·0	+0 50 −4 0·4 [c]		
1821	49 25·5	8 11·5	8 3·5	8 11·5	8 11·5	−4 0 −0 8·0 [d]		
1835	55 53	8 3·9	6 22·2	8 3·9	8 3·9	−2 25 −1 15·7		
1866	....	9 28·4	9 23·2	9 28·4	9 28·4	+3 25 −0 5·2 [e]		
1889	16 20 35	8 33·8	8 19·8	8 33·6	8 33·7	−0 25 −0 13·9		
1915	....	8 19·2	10 8·2	8 19·2	8 19·2	−0 5 +1 23·0	30·143	60·8

[a] The sector appears to have shifted in azimuth. [b] Slightly adjusted in azimuth. [c] Ditto. [d] Ditto. [e] Ditto.

Totally overcast. The plane of the arch did not continue at a constant distance throughout its extent when carried north and south. Star No. 1661 did not continue well bisected through the middle of the field. These errors were corrected, the latter by hitching the stop. ε *Scorpii* No. 1915 remained bisected at transit. These circumstances must be attended to in the reductions.

Saturday, May 19, was cloudy without any indication of clearing up, and I returned to the Royal Observatory. *Sunday, May* 20, was cloudy with indications of rain; but late in the evening the sky became clear, and the remainder of the night was fine, yet too far advanced to encourage a visit to the sector.

MAY 21ST, 1838, FACE OF SECTOR EAST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
869	6 51 53	9 12·5	9 21·0	9 13·2	9 12·85	+5 10 +0 8·15	30·211	61·8
915	....	8 32·4	12 16·4	8 32·7	8 32·55	+4 55 +3 17·85[a]		
1015	8 12 19	8 2·3	9 21·0	8 2·0	8 2·15	−2 25 +1 18·85[b]		
1061	33 32·5	8 18·2	10 27·2	8 18·4	8 18·3	−0 50 +2 8·9		
1115	9 2 43·5	9 1·8	14 9·8	9 1·8	9 1·8	+4 10 +5 8·0		
(2566)*	29 53·5	9 1·2	3 25·5	9 1·2	9 1·2	+2 30 −3 9·7		
(2823)*	58 11	9 5·4	7 12·7	9 5·2	9 5·3	+3 50 −1 26·6		
1243	10 19 24·5	9 7·2	10 10·0	9 7·4	9 7·3	+3 40 +1 2·7		
1356	11 24 44·5	10 8·5	14 29·4	10 8·7	10 8·6	+2 55 +4 20·8		
1378	44 29·5	10 4·3	9 30·8	10 3·8	10 4·05	+0 55 −0 7·25		
1527	....	9 16·3	7 24·3	9 16·3	9 16·3	−1 55 −1 26·0	30·215	61·7
1562	13 36 14	8 32·7	3 18·9	8 32·7	8 32·7	+1 45 −5 13·8		
1579	....	8 32·7	7 8·3	8 32·7	8 32·7	+1 45 −1 24·4		
1604	....	8 13·4	10 18·5	8 13·4	8 13·4	−1 40 +2 5·1[c]		
1661	14 33 35	8 25·8	12 16·4	8 25·8	8 25·8	−0 35 +3 24·6		
1742	15 12 42	8 9·8	6 24·3	8 9·6	8 9·7	−2 20 −1 19·4		
1774	28 24·2	9 6·7	10 30·2	9 6·9	9 6·8	+4 40 +1 23·4[d]		
1797	40 27·5	....	4 17·7	8 19·3	....	+0 50 −4 1·6		
1821	49 19·3	7 31·9	7 25·1	7 32·0	7 31·95	−4 0 −0 6 85[e]		
1835	....	8 6·4	6 25·4	8 6·4	8 6·4	−2 25 −1 15·0[f]		
1866	16 9 0·8	8 9·4	8 6·6	8 9·4	8 9·4	+3 25 −0 2·8[g]		
1915	39 37·5	7 33·7	9 23·5	7 33·7	7 33·7	−0 5 +1 23·8		
1947	53 57·5	7 23·3	11 22·0	7 23·1	7 23·2	0 0 +3 32·8		
1969	17 6 17	8 8·4	12 0·8	8 8·6	8 8·5	+1 25 +3 26·3		
2007	....	8 7·8	11 21·7	8 7·8	8 7·8	−3 5 +3 13·9[h]		
2043	38 43	8 7·8	11 2·7	8 8·0	8 7·9	−3 5 +2 28·8		
2079	55 6·3	8 26·7	9 15·5	8 26·5	8 26·6	+3 30 +0 22·9		
2101	18 6 32·5	8 17·3	3 33·8	8 17·5	8 17·4	−2 50 −4 17·6		
2110	13 13·5	8 32·2	6 0·8	8 32·1	8 32·15	−0 30 −2 31·35		

[a] 10s past the middle wire. [b] Milky atmosphere. [c] 10s past the middle wire. [d] Faint.
[e] Nearly invisible. [f] Faint. [g] Dense haze. [h] Leaving the field.

* Numerals of BRISBANE's Catalogue.

MAY 22ND, 1838, FACE OF SECTOR WEST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
1356	11 24 27·5	7 12·6	4 4·5	7 12·5	7 12·55	+2 55 +3 8·05	30·115	62
1579	13 42 1·5	8 5·8	11 11·3	8 5·8	8 5·8	+1 45 −3 5·5[a]		
1604	....	8 17·8	7 27·4	8 17·8	8 17·8	−1 40 +0 24·4[b]		
1661	....	8 15·5	6 6·2	8 15·5	8 15·5	−0 35 +2 9·3[c]		
1742	15 12 29·5	8 19·6	11 19·7	8 19·5	8 19·55	−2 20 −3 0·15[d]		
1774	28 11	8 19·2	8 8·9	8 19·2	8 19·2	+4 40 +0 10·3		
1797	....	8 16·5	13 32·4	8 16·5	8 16·5	+0 50 −5 15·9[e]		
1821	49 7·5	9 6·4	10 28·8	9 6·4	9 6·4	−4 0 −1 22·4[f]		
1835	55 38	9 5·2	12 0·3	9 5·2	9 5·2	−2 25 −2 29·1[g]		
1866	....	8 18·9	10 4·7	8 18·8	8 18·85	+3 25 −1 19·85[h]		
1889	16 20(25?)	8 33·5	10 26·3	8 33·9	8 33·7	−0 25 −1 26·6[i]		
1915	39 17	8 24·8	8 16·4	8 24·8	8 24·8	−0 5 +0 8·4		
1947	....	8 25·6	6 10·7	8 25·6	8 25·6	0 0 +2 14·9[k]		
1969	17 6 5·5	8 27·3	6 14·4	8 27·1	8 27·2	+1 25 +2 12·8		
2007	22 18·5	9 4·8	7 5·0	9 4·8	9 4·8	−3 5 +1 33·8		
2043	38 31·5	9 4·8	7 26·2	9 4·7	9 4·75	−3 5 +1 12·55		
2079	54 54·2	8 21·7	9 14·5	8 21·7	8 21·7	+3 30 −0 26·8		
2101	18 6 21	9 2·2	15 0·6	9 2·0	9 2·1	−2 50 +5 32·5		
2110	....	....	13 21·6	9 10·3	....	−0 30 −4 11·3		

[a] Cloudy day. [b] Clearing up; hot air. [c] 10^s past the middle wire. [d] Seen through thin cloud.
[e] 8^s past the middle wire. [f] Seen through haze. [g] Very faint. [h] Faint.
[i] Faint. [k] 15^s past the middle wire.

May 23, cloudy day; heavy rain in the night.
May 24, heavy rain with thunder.
May 25, heavy rain at intervals.
May 26, cleared up.

MAY 26TH, 1838, FACE OF SECTOR WEST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
791	....	9 24·8	9 25·0	9 24·8	9 24·8	+3 55 −0 0·2[a]	30·400	61·5
869	6 51 47	9 27·8	10 33·8	9 27·8	9 27·8	+5 10 −1 6·0		
1061	8 33 25·5	9 29·3	9 0·7	9 29·3	9 29·3	−0 50 +0 28·6		
(2823)*	9 57 33·5	9 8·5	12 15·6	9 8·0	9 8·25	+3 50 −3 7·35		
1356	11 24 38·5	8 28·8	5 22·9	8 28·8	8 28·8	+2 55 +3 5·9		
1378	44 23	8 29·3	10 21·8	8 29·3	8 29·3	+0 55 −1 26·5		
1433	12 19 33·5	8 29·0	7 4·4	8 29·2	8 29·1	−4 15 +1 24·7[b]		
1527	13 11 14	8 19·9	11 28·2	8 20·0	8 19·95	−4 15 −3 8·25		
1562	....	8 13·6	15 7·5	8 13·5	8 13·55	+1 45 −6 27·95		
1579	....	8 13·5	11 20·6	8 13·5	8 13·5	+1 45 −3 7·1		
1604	56 53·5	8 29·0	8 6·1	8 28·8	8 28·9	−1 40 +0 22·8	30·422	61·2
1661	14 33 28/26 ?	8 31·1	6 21·7	8 31·2	8 31·15	−0 35 +2 9·45		
1774	15 28 17·5	9 6·0	8 31·6	9 6·0	9 6·0	+4 40 +0 8·4		
1797	....	9 19·3	15 1·2	9 19·3	9 19·3	+0 50 −5 15·9		
1821	49 11·7	10 1·2	11 23·6	10 1·1	10 1·15	−4 0 −1 22·45		
1835	55 43·5	10 2·0	12 32·6	10 2·0	10 2·0	−2 25 −2 30·6		
1866	....	9 27·0	11 12·8	9 27·0	9 27·0	+3 25 −1 19·8[c]		
1915	16 39 23	9 32·0	9 26·6	9 32·0	9 32·0	−0 5 +0 5·4		
1947	....	9 9·3	6 28·4	9 9·3	9 9·3	0 0 +2 14·9		
1969	17 6 11·5	9 18·8	7 7·2	9 18·8	9 18·8	+1 25 +2 11·6		
2007	22 23·5	10 4·7	8 7·7	10 4·9	10 4·8	−3 5 +1 31·1		
2043	38 37	10 4·9	8 26·7	10 4·9	10 4·9	−3 5 +1 12·2		
2079	55 0·5	9 27·0	10 20·5	9 26·8	9 26·9	+3 30 −0 27·6		
2101	18 5 56·5	10 4·7	16 3·8	10 4·7	10 4·7	−2 50 −5 33·1		
2110	13 7·5	10 13·5	14 24·6	10 13·5	10 13·5	−0 30 −4 11·1		

[a] Occasional interruptions from clouds. [b] Bad light. [c] 10^s past the middle wire.

* Numeral of BRISBANE's Catalogue.

MAY 27TH, 1838, FACE OF SECTOR EAST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
699	5 33 31	9 32·3	11 14·9	9 32·3	9 32·3	−0 15 +1 16·6		
732	....	....	11 13·0	10 2·2	....	−1 55 +1 10·8	30·287	61
791	6 13 48·5	10 16·7	12 0·5	10 16·8	10 16·75	+3 55 +1 17·75		
848	43 32	10 16·2	12 13·4	10 16·2	10 16·2	+1 35 +1 31·2		
869	51 57·5	10 24·8	11 0·8	10 24·8	10 24·8	−5 10 +0 10·0		
903	7 11 32	10 29·4	14 15·4	10 29·0	10 29·2	−2 55 +3 20·2		
915	....	11 13·9	13 6·4	11 13·9	11 13·9	+4 55 +1 26·5		
1061	....	10 28·3	13 5·2	10 28·3	10 28·3	−0 50 +2 10·9[a]		
(2566)*	9 29 56·5	10 1·8	6 28·4	10 1·8	10 1·8	+2 30 −3 7·4[b]		
(2823)*	58 14	9 14·7	7 23·5	9 14·7	9 14·7	+3 50 −1 25·2		
1243	10 19 29	7 23·4	8 27·9	7 23·0	7 23·2	+3 40 +1 4·7		
1299	48 59	8 0·0	6 27·3	8 0·0	8 0·0	−2 20 −1 6·7		
(3350)*	55 17·5	8 33·0	8 32·9	8 33·0	8 33·0	+2 50 −0 0·1		
1378	11 44 30	9 2·7	8 30·5	9 2·6	9 2·65	+0 55 −0 6·15		
1433	....	9 3·7	12 10·6	9 3·7	9 3·7	−4 15 +3 6·9		
1527	13 11 20	9 4·2	7 13·8	9 4·4	9 4·3	−1 55 −1 24·5		
1562	36 16	9 32·3	4 19·7	9 32·2	9 32·25	+1 45 −5 12·55		
1579	42 15·5	9 32·2	8 8·4	9 32·2	9 32·2	+1 45 −1 23·8		
1604	56 59	10 1·4	12 7·5	10 1·4	10 1·4	−1 40 +2 6·1		
1661	14 33 34·5	9 25·4	13 15·3	9 25·4	9 25·4	−1 35 +3 23·9		
1774	15 28 28·5	11 4·2	12 27·0	11 4·2	11 4·2	+4 40 +1 22·8	30·200	61
1797	40 29·5	11 4·3	7 3·4	11 4·2	11 4·25	+0 50 −4 0·85		
1821	49 15·5	10 33·8	10 25·8	10 33·6	10 33·7	−4 0 −0 7·9		
1835	55 48·5	10 18·0	9 2·4	10 17·9	10 17·95	−2 25 −1 15·55		
1866	16 9 4	....	10 23·5	10 25·8	....	+3 25 −0 2·3		
1889	20 37·2	9 20·6	9 7·8	9 20·6	9 20·6	−0 25 −0 12·8	30·148	60·8
1915	39 29·5	9 18·5	11 7·7	9 18·4	9 18·45	−0 5 +1 23·25		
1947	54 56·5	9 21·2	13 20·7	9 21·2	9 21·2	0 0 +3 33·5		
1969	17 6 19	9 28·3	13 20·2	9 28·3	9 28·3	+1 25 +3 25·9		
2007	....	....	13 7·4	9 27·2	....	−3 5 +3 14·2[c]		
2079	55 9·5	12 17·5	13 7·3	12 17·5	12 17·5	+3 30 +0 23·8		
2101	18 6 30·5	8 27·2	4 11·1	8 27·2	8 27·2	−2 50 −4 16·1	30·115	60·7
2110	13 13·7	8 30·6	6 0·0	8 30·6	8 30·6	−0 30 −2 30·6[d]		

[a] 15^s past middle wire. [b] Milky atmosphere. [c] Hurried. [d] Torch like.

* Numerals of BRISBANE's Catalogue.

MAY 28TH, 1838, FACE OF SECTOR WEST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
699	5 33 22·5	9 3·0	9 0·1	9 3·0	9 3·0	−0 15 +0 2·9	30·075	61
732	44 51·5	9 3·2	9 7·6	9 3·2	9 3·2	−1 55 −0 4·4[a]		
903	....	9 32·8	7 28·7	9 33·2	9 33·0	−2 55 +2 4·3[b]		
915	7 17 9·5	9 13·8	9 2·2	9 13·8	9 13·8	+4 55 +0 9·6[c]		
957	39 7	10 9·2	10 4·6	10 9·2	10 9·2	−3 40 +0 4·6	30·075	61
1015	8 12 6·5	10 12·7	10 6·5	10 12·7	10 12·7	−2 15 +0 6·2[d]		
1061	33 20·3	10 15·2	9 19·8	10 15·5	10 15·35	−0 50 +0 29·55		
(2566)*	9 29 44	11 3·8	15 28·7	11 3·7	11 3·75	+2 30 −4 24·95		
(2823)*	58 2·5	11 0·4	14 8·4	11 0·4	11 0·4	+3 50 −3 8·0		
1243	....	10 16·5	10 29·8	10 16·7	10 16·6	+3 40 −0 13·2		
1299	10 48 47·5	10 10·4	13 0·5	10 10·5	10 10·45	−2 20 −2 24·05		
(3350)*	....	9 29·5	11 13·4	9 29·7	9 29·6	+2 50 −1 17·8		
1356	11 24 35·5	10 1·7	6 31·0	10 1·7	10 1·7	−2 55 +3 4·7		
1378	44 20·5	10 5·0	11 26·3	10 5·2	10 5·1	+0 55 −1 21·2		

[a] Clouds coming over. [b] Cloudy. [c] Good observation. [d] Very faint.

* Numerals of BRISBANE's Catalogue.

The sky totally obscured.

MAY 29TH, 1838, FACE OF SECTOR WEST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
699	5 33 21	10 30·2	10 25·5	10 30·2	10 30·2	−0 15 +0 4·7	30·225	71
732	44 51	10 28·5	10 31·3	10 28·6	10 28·55	−1 55 −0 2·75		
791	6 13 36·5	10 32·4	10 30·3	10 32·3	10 32·35	+3 55 +0 2·05		
869	51 45	10 26·2	11 28·6	10 26·1	10 26·15	+5 10 −1 2·45		
903	7 11 2·8	10 8·7	8 1·4	10 8·7	10 8·7	−2 55 +2 7·3		
915	....	10 5·6	9 25·1	10 5·4	10 5·5	+4 55 +0 14·4		
957	39 7	10 24·3	10 18·1	10 24·3	10 24·3	−3 40 +0 6·2		
1061	8 33 21·2	10 21·4	9 23·9	10 21·4	10 21·4	−0 50 +0 31·5		

MAY 29TH, 1838, FACE OF SECTOR WEST (*continued*).

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
1070	....	10 19·3	13 19·3	10 19·5	10 19·4	+1 20 −2 33·9[a]		
(2566)*	....	10 21·8	15 10·5	10 22·0	10 21·9	+2 30 −4 22·6		
(2823)*	9 58 2·5	....	14 7·3	11 1·3	....	+3 50 −3 6·0		
1243	10 19 16	10 20·8	10 31·8	10 21·0	10 20·9	+3 40 −0 10·9[b]	30·190	61·1
1299	48 49·5	10 14·3	13 1·3	10 14·4	10 14·35	−2 20 −2 20·95		
(3350)*	....	....	11 33·0	10 17·4	....	+2 50 −1 15·6[c]		
1356	11 24 36·5	10 19·3	7 12·3	10 19·3	10 19·3	+2 55 +3 7·0		
1378	44 20	10 22·4	12 7·5	10 22·5	10 22·45	+0 55 −1 19·05		
1527	13 11(39·5?)	9 20·2	12 27·6	9 20·2	9 20·2	−1 55 −3 7·4		
1562	....	9 33·5	16 26·2	9 33·5	9 33·5	+1 45 −6 26·7		
1579	42 5·5	9 33·5	13 4·2	9 33·5	9 33·5	+1 45 −3 4·7		
1604	56 49	10 11·7	9 22·0	10 11·7	10 11·7	−1 40 +0 23·7		
1661	14 33 25	10 16·3	8 4·8	10 16·3	10 16·3	−0 35 +2 11·5		
1742	15 12 29·5	10 20·6	13 19·7	10 20·6	10 20·6	−2 20 −2 23·1		
1774	28 16·5	10 20·3	10 10·7	10 20·2	10 20·25	+4 40 +0 9·55		
1797	40 16·8	....	15 15·7	10 0·4	....	+0 50 −5 15·3		
1821	49 6	....	13 0·3	11 12·0	....	−4 0 −1 22·3		
1835	55 38·5	11 3·1	13 33·2	11 2·9	11 3·0	−2 25 −2 30·2		
1866	16 9 (4?)	9 10·6	10 29·0	9 10·6	9 10·6	+3 25 −1 18·4		
1889	20 27	9 10·2	11 2·4	9 10·2	9 10·2	−0 25 −1 26·2		
1915	39 19	9 11·4	9 3·7	9 11·4	9 11·4	−0 5 +0 7·7		
1947	54 48·5	9 12·7	6 29·4	9 12·6	9 12·65	0 0 +2 17·25		
1969	17 6 8·5	9 24·3	7 12·3	9 24·3	9 24·3	+1 25 +2 12·0		
2007	22 18	10 6·9	8 8·4	10 6·9	10 6·9	−3 5 +1 32·5		
2043	38 31·5	10 6·9	8 27·2	10 7·0	10 6·95	−3 5 +1 13·75		
2079	54 58·5	10 1·7	10 28·6	10 1·7	10 1·7	+3 30 −0 26·9		
2101	18 6 21	10 14·7	16 12·8	10 14·7	10 14·7	−2 50 −5 32·1		
2110	13 3·5	10 12·3	14 22·7	10 12·5	10 12·4	−0 30 −4 10·3		
2741	22 48 14·5	10 5·8	7 31·8	10 5·8	10 5·8	+3 25 +2 8·0		

[a] 20ˢ past the middle wire. [b] The second not certain. [c] A fine observing night.

* Numerals of BRISBANE's Catalogue.

Before the observations commenced the telescope was moved in azimuth by the upper adjusting screw, to place the axis of suspension truly perpendicular to the back arch, from which it had deviated.

MAY 30TH, 1838, FACE OF SECTOR EAST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
869	6 52 8·5	12 13·6	12 26·7	12 13·8	12 13·7	+5 10 +0 13·0		
1356	11 24 51·5	8 31·8	13 21·6	8 32·4	8 32·1	+2 55 +4 23·5		
1378	44 29·5	9 2·7	8 30·2	9 2·5	9 2·6	+0 55 −0 10·4		
1433	12 19 20·5	8 27·8	11 33·8	8 27·8	8 27·8	−4 15 +3 6·0		

Overcast. The sector was moved a little eastward in azimuth after the above observations.

May 31*st*. Heavy rain. Great difficulty in keeping the sector dry.
June 1*st*. Cloudy.

JUNE 2ND, 1838, FACE OF SECTOR EAST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
791	6 13 44	13 26·2	15 9·7	13 26·0	13 26·1	+3 55 +1 17·6	30·062	59·2
869	51 55	10 9·6	10 21·2	10 9·9	10 9·75	+5 10 +0 11·45[a]		
903	7 11 2·5	9 15·0	13 3·0	9 15·1	9 15·05	−2 55 +3 21·95		
957	....	9 2·4	10 24·7	9 2·5	9 2·45	−3 40 +1 22·25[b]		
1070	....	8 24·6	7 4·2	8 24·2	8 24·4	+1 20 −1 20·2		
(2823)*	9 58 1·5	9 6·2	7 15·3	9 6·2	9 6·2	+3 50 −1 24·9[c]		
1243	10 19 16·2	9 8·3	10 13·9	9 8·3	9 8·3	+3 40 +1 5·6[d]		
1299	48 48	9 12·8	8 6·5	9 12·7	9 12·75	−2 20 −1 6·25		
1378	....	12 26·1	12 20·2	12 26·1	12 26·1	+0 55 −0 5·9		

[a] This transit shews the sector too westerly; moved it. [b] Faint: indifferent observation.
[c] Faint. [d] Very good.

* Numeral of BRISBANE's Catalogue.

Overcast and misty; the weather is very unfavourable.

JUNE 3RD, 1838, FACE OF SECTOR EAST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
699	5 33 18·5	7 30·8	9 16·8	7 30·6	7 30·7	+0 15 +1 20·1	29·998	59·3
732	....	7 30·7	9 10·3	7 30·8	7 30·75	−1 55 +1 13·55		
869	6 51 43·5	8 21·5	8 32·6	8 21·7	8 21·6	+5 10 +0 11·0		
903	7 10 59·5	8 23·0	12 11·7	8 23·2	8 23·1	−2 55 +3 22·6		
915	....	9 30·5	11 25·6	9 30·5	9 30·5	+4 55 +1 29·1 [a]		

[a] 15ˢ past middle wire.

Totally overcast. In the evening a strong north-west gale came on.

JUNE 4TH, 1838, FACE OF SECTOR EAST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
699	5 33 14	12 15·8	14 2·0	12 15·8	12 15·8	−0 15 +1 20·2	30·096	60·5
732	....	11 1·7	12 16·4	11 1·8	11 1·75	−1 55 +1 14·65		
791	6 13 30	10 12·8	11 32·4	10 13·0	10 12·9	+3 55 +1 19·5		
869	51 38·5	9 33·8	10 11·4	9 33·7	9 33·75	+5 10 +0 11·65		
1243	10 19 10	8 20·7	9 27·1	8 20·9	8 20·8	+3 40 +1 6·3	30·031	60·3
1299	48 40·5	8 18·7	7 11·8	8 18·8	8 18·75	−2 0 −1 6·95		
1356	11 24 29·5	7 23·6	12 13·3	7 23·6	7 23·6	+2 55 +4 23·7		
1378	44 12·2	7 14·9	7 9·8	7 14·9	7 14·9	+0 55 −0 5·1		
1433	....	7 15·0	10 22·4	7 15·0	7 15·0	−4 15 +3 7·4 [a]		
1562	13 35 58·5	7 11·3	1 33·5	7 11·4	7 11·35	+1 45 −5 11·85 [b]		
1579	41 58	7 10·2	5 21·7	7 10·2	7 10·2	+1 45 −1 22·5		
1604	56 42	7 20·4	9 26·3	7 20·6	7 20·5	−1 40 +2 5·8	30·020	60·2
1835	....	9 26·6	8 12·4	9 26·6	9 26·6	−2 25 −1 14·2		
1915	16 19 11	10 5·8	11 30·2	10 5·8	10 5·8	−0 5 +1 24·4		

[a] Mist. [b] Faint; the upper dot not examined.

At $14^h\ 33^m$ S.T. dense volumes of cloud from the south-west, occasionally becoming thinner. $16^h\ 40^m$ misty rain, and heavy rain on the morning of the 5th.

The instrument has not been reversed in azimuth, in the hope of procuring observations of those stars which have not been seen for several days.

JUNE 5TH, 1838, FACE OF SECTOR EAST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
1527	13 11 59·5	9 17·5	7 28·3	9 17·5	9 17·5	−1 55 −1 23·2		
1569	35 56·5	10 6·2	4 28·0	10 6·1	10 6·15	+1 45 −5 12·15		
1579	....	10 6·1	8 16·7	10 5·8	10 5·95	+1 45 −1 23·25		
1604	56 39·5	10 12·5	12 18·4	10 12·3	10 12·4	−1 40 +2 6·0		

Rain.

JUNE 6TH, 1838, FACE OF SECTOR EAST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
1356	11 24 22	11 27·3	16 16·4	11 27·1	11 27·2	+2 55 +4 23·2	30·288	59
1378	44 6	8 33·2	8 27·4	8 33·0	8 33·1	+0 55 −0 5·7		
1433	12 19 13·5	8 29·0	12 1·7	8 29·0	8 29·0	−4 15 +3 6·7		
1527	13 10 54·5	9 7·4	7 16·3	9 7·4	9 7·4	−1 55 −1 25·1		
1562	35 51	9 9·1	3 30·9	9 9·1	9 9·1	+1 45 −5 12·2		
1579	41 50·5	9 9·1	7(29·3)	9 9·1	9 9·1	+1 45 −1 13·8 [a]		
1604	56 34·5	10 5·9	12 11·5	10 5·8	10 5·85	−1 40 +2 5·65	30·284	58·8
1742	15 12 14·5	9 25·6	8 6·0	9 25·6	9 25·6	−2 20 −1 19·6		
1774	28 2·5	9 7·2	(11)29·8	9 7·0	9 7·1	+4 4 +1 22·7 [b]		
1797	40 (3?)	8 26·8	4 24·6	8 27·2	8 27·0	+0 50 −4 2·4		
1821	....	9 33·5	9 26·7	9 33·7	9 33·6	−4 0 −0 6·9		
1835	....	9 28·9	8 13·8	9 28·8	9 28·85	−2 25 −1 15·05		
1866	16 8 38	11 1·0	10 32·1	11 1·0	11 1·0	+3 25 −0 2·9		
1889	20 13	9 33·0	9 20·5	9 32·8	9 32·9	−0 25 −0 12·4		
1915	39 3·5	9 30·1	11 19·4	9 29·8	9 29·95	−0 5 +1 23·45		
1947	....	9 13·2	13 12·5	9 13·2	9 13·2	0 0 +3 33·3		
1969	17 5 53	9 24·0	13 16·3	9 24·0	9 24·0	+1 25 +3 26·3		
2007	22 1·5	9 23·0	13 5·0	9 23·0	9 23·0	−3 5 +3 16·0		
2079	54 43·5	10 6·3	10 31·0	10 6·3	10 6·3	+3 30 +0 24·7		
2101	18 6 4·5	10 6·7	5 24·2	10 6·6	10 6·65	−2 50 +4 16·45		
2110	13 47·5	9 33·8	7 3·2	9 33·6	9 33·7	−0 30 −2 30·5		

[a] There is a mistake of 10 divisions in reading off: the reading for the star ought to be $7^{r}\ 19^{p}{\cdot}3$.

[b] The micrometer reading for the star should be $10^{r}\ 29^{p}{\cdot}8$.

JUNE 7TH, 1838, FACE OF SECTOR WEST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
699	5 32 56·5	10 19·2	10 16·2	10 19·2	10 19·2	−0 15 +0 3·0	30·260	59
732	44 20	10 7·8	10 11·6	10 7·9	10 7·85	−1 55 −0 3·75[a]		
791	....	9 30·7	9 28·2	9 30·5	9 30·6	+3 35 +0 2·4		
1299	10 48 16·5	11 17·3	14 6·8	11 17·3	11 17·3	−2 20 −2 23·5		
(3350)*	....	....	12 29·7	11 14·2	....	+2 50 −1 15·5		
1356	11 24 17·5	11 17·0	8 11·2	11 17·0	11 17·0	+2 55 +3 5·8[b]		
1378	43 54·5	11 14·7	13 1·7	11 14·7	11 14·7	+0 55 −1 21·0		
1433	....	11 23·4	9 31·8	11 23·7	11 23·55	−4 15 +1 25·75		
1527	....	11 13·8	14 21·7	11 14·0	11 13·9	−1 55 −3 7·8		
1562	13 35 40	9 24·6	16 20·0	9 24·5	9 24·55	+1 45 −6 29·45		
1579	41 40·5	9 24·5	12 32·5	9 24·5	9 24·5	+1 45 −3 8·0		
1604	56 19·5	10 1·0	9 14·6	10 1·0	10 1·0	−1 40 +0 20·4[c]		
1661	14 32 57·5	10 6·7	7 32·4	10 6·8	10 6·75	−0 35 +2 8·35		
1742	15 12 4	10 7·2	13 8·2	10 7·2	10 7·2	−2 20 −3 1·0		
1774	27 48	10 8·2	9 33·6	10 8·3	10 8·25	+4 40 +0 8·65[d]		
1797	39 51	10 6·5	15 22·4	10 6·5	10 6·5	+0 50 −5 15·9		
1821	48 35·5	10 32·7	12 22·3	10 32·7	10 32·7	−4 0 −1 23·6		
1835	55 9·5	....	13 29·4	10 32·0	....	−2 25 −2 31·4[e]		
1866	16 8 28	....	13 6·3	11 19·1	....	+3 25 −1 21·2		
1889	19 59	11 8·4	13 1·8	11 8·4	11 8·4	−0 25 −1 27·4		
1915	38 51	10 19·6	10 12·4	10 19·5	10 19·55	−0 5 +0 7·15		
1947	53 21	10 24·5	8 8·1	10 24·4	10 24·45	0 0 +2 16·35	30·240	58
1969	17 5 42·5	10 24·9	8 14·2	10 24·7	10 24·8	+1 25 +2 10·6		
2007	21 48	10 3·5	8 6·3	10 3·5	10 3·5	−3 5 +1 31·2		
2043	....	10 3·5	8 26·2	10 3·3	10 3·4	−3 5 +1 11·2		
2079	54 35	10 0·0	10 28·8	10 0·0	10 0·0	+3 30 −0 28·8		
2101	18 5 (13·5?)	10 17·0	16 16·4	10 17·0	10 17·0	−2 50 −5 33·4		
2110	12 36	10 4·4	14 16·2	10 4·3	10 4·35	−0 30 −4 11·85		

[a] After this transit the sector was moved a little in azimuth.

[b] After this transit the sector was moved a little more eastward.

[c] After this transit moved the sector in azimuth.

[d] After this transit moved the sector in azimuth.

[e] Stars rather crabby.

* Numeral of BRISBANE's Catalogue.

This has been the first good observing night since the 1st of May. Many of the smaller stars visible at Klyp Fonteyn now transit in the day time and cannot be observed. If the weather had been favourable, the observations at the present station could have been completed last month.

June 8th, 1838, Face of Sector East.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev pts.	° ′ rev. pts.	in.	°
699	5 32 58·5	9 7·1	10 27·3	9 6·5	9 6·8	−0 15 +1 20·5	30·145	58·4
732	44 28	9 10·4	10 25·5	9 10·4	9 10·4	−1 55 +1 15·1		
848	....	9 24·1	11 23·0	9 24·3	9 24·2	+1 35 +1 32·8		
869	6 51 24	8 33·4	9 11·7	8 33·6	8 33·5	+5 10 +0 12·2		
903	7 10 39	8 17·2	12 5·8	8 17·0	8 17·1	−2 55 +3 22·7		
915	·16 50·2	9 18·4	11 14·4	9 18·3	9 18·35	+4 55 +1 30·05		
1061	8 32 59	9 12·8	11 24·7	9 12·8	9 12·8	−0 50 +2 11·9[a]		
1243	10 18 54·5	9 3·8	10 9·5	9 3·8	9 3·8	+3 40 +1 5·7[b]		
1299	48 25·5	9 7·5	7 32·7	9 7·4	9 7·45	−2 20 −1 8·75[c]		
1356	11 24 14	8 33·6	13 21·3	8 33·2	8 33·4	+2 55 +4 21·9		
1378	43 57	9 29·8	9 23·3	9 29·8	9 29·8	+0 55 −0 6·5		
1433	12 19 4	9 9·7	12 14·7	9 9·5	9 9·6	−4 15 +3 5·1[d]		
1527	13 10 46	10 19·8	8 28·4	10 19·6	10 19·7	−1 55 −1 25·3		
1562	35 43	9 20·9	4 8·3	9 20·9	9 20·9	+1 45 −5 12·6	30·135	58
1579	41 42·5	9 20·9	7 30·5	9 20·8	9 20·85	+1 45 −1 24·35		
1604	56 26	9 14·4	11 21·2	9 14·4	9 14·4	−1 40 +2 6·8		
1661	14 33 1	9 10·1	12 33·9	9 10·1	9 10·1	−0 35 +3 23·8		
1742	15 12 6	9 10·3	7 26·5	9 10·3	9 10·3	−2 20 −1 17·8	30·112	58
1774	27 55	9 24·7	11 16·1	9 24·7	9 24·7	+4 40 +1 25·4		
1797	39 54·5	9 32·3	5 32·2	9 32·3	9 32·3	+0 50 −4 0·1	30·111	58
1821	48 42·5	8 3·7	7 30·9	8 3·3	8 3·5	−4 0 −0 6·6		

[a] Faint. [b] Good. [c] Faint. [d] Faint.

Called off suddenly to the Observatory.

The sky became cloudy on the 9th; stormy weather succeeded, with thunder and heavy rain, which ceased on the 13th.

JUNE 14TH, 1838, FACE OF SECTOR WEST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
1579	13 41 4·5	9 21·8	12 29·4	9 21·8	9 21·8	+1 45 −3 7·6	30·134	56
1915	16 38 13·5	9 16·0	9 11·0	9 16·0	9 16·0	−0 5 +0 5·0		
1947	52 43	9 19·6	7 5·0	9 19·6	9 19·6	0 0 +2 14·6		
1969	....	....	7 1·3	9 12·2	....	+1 25 +2 10·9		
2007	17 21 5	9 21·1	7 24·5	9 21·0	9 21·05	−3 5 +1 30·55		
2043	37 18	9 21·0	8 11·0	9 21·1	9 21·05	−3 5 +1 10·05		
2079	54 1	9 8·3	10 3·5	9 8·5	9 8·4	+3 30 −0 29·1		
2101	....	9 11·8	15 11·7	9 11·8	9 11·8	−2 50 −5 33·9[a]		
2110	18 11 57	9 15·6	13 28·8	9 15·6	9 15·6	−0 30 −4 13·2		

[a] 10^s past the middle wire.

Heavy rain again came on, which continued on the 15th and 16th.
The winter has set in unusually early.

JUNE 17TH, 1838, FACE OF SECTOR WEST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
699	5 32 0·5	9 15·3	9 6·5	9 15·2	9 15·25	−0 15 +0 8·75	30·150	58
732	43 26	9 11·9	9 9·8	9 11·9	9 11·9	−1 55 +0 2·1[a]		
1061	8 31 8	9 12·6	8 13·7	9 12·6	9 12·6	−0 50 +0 32·9		
1356	11 23 17	9 2·0	5 30·3	9 2·1	9 2·05	+2 55 +3 5·75		
1378	42 58	8 29·8	10 17·3	8 29·7	8 29·75	+0 55 −1 21·55		
1433	12 17 58	8 20·9	6 31·2	8 21·0	8 20·95	−4 15 +1 23·75		
1527	13 9 45	8 28·8	12 3·7	8 28·7	8 28·75	−1 55 −3 8·95	30·235	58·2
1562	34 43·5	8 33·5	15 29·1	8 33·5	8 33·5	+1 45 −6 29·6		
1579	40 43·2	8 33·5	12 6·8	8 33·5	8 33·5	+1 45 −3 7·3		
1604	54 24·5	9 16·0	8 29·4	9 16·0	9 16·0	−1 40 +0 20·6		
1661	14 32 0·5	9 13·3	7 6·5	9 13·3	9 13·3	−0 35 +2 6·8	30·235	58·2

[a] After this transit the sector was moved in azimuth a small quantity.

JUNE 17TH, 1838, FACE OF SECTOR WEST (*continued*).

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
1742	15 11 4	9 10·2	12 13·2	9 10·2	9 10·2	−2 20 −3 3·0		
1774	26 56·5	8 22·6	8 17·9	8 22·8	8 22·7	+4 40 +0 4·8		
1797	38 55·2	8 29·7	14 15·2	8 29·7	8 29·7	+0 50 −5 19·5		
1821	47 39	10 0·5	11 27·5	10 0·4	10 0·45	−4 0 −1 27·05		
1835	54 13·5	9 12·6	12 13·4	9 12·6	9 12·6	−2 25 −3 0·8		
1866	....	9 10·8	10 32·7	9 10·8	9 10·8	+3 25 −1 21·9		
1889	16 19 3·5	9 16·9	11 13·1	9 16·9	9 16·9	−0 25 −1 30·2		
1915	37 55·5	9 18·0	9 13·0	9 18·0	9 18·0	−0 5 +0 5·0		
1947	52 25	....	7 1·1	9 14·5	....	0 0 +2 13·4		
1969	17 4 46·5	9 3·3	6 29·3	9 3·3	9 3·3	+1 25 +2 8·0		
2007	20 52·5	9 15·8	7 20·5	9 15·8	9 15·8	−3 5 +1 29·3	30·235	58·2
2043	37 5·5	9 15·8	8 6·4	9 16·0	9 15·9	−3 5 +1 9·5[b]		
2079	53 38	8 26·4	9 21·7	8 26·6	8 26·5	+3 30 −0 29·2		
2101	18 4 55·2	9 21·3	15 22·7	9 21·3	9 21·3	−2 50 −6 1·4		
2110	11 40	9 28·1	14 8·8	9 28·2	9 28·15	−0 30 −4 14·65		
2741	22 46 52·5	9 2·5	6 27·1	9 2·0	9 2·25	+3 25 +2 9·15		

[b] Beautiful definition.

α Columbæ this day transits at noon; but it will continue to be entered under the head of the following day, with the great mass of the observations, for convenience.

JUNE 18TH, 1838, FACE OF SECTOR EAST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
869	6 52 33	9 32·4	10 13·6	9 32·1	9 32·25	+5 10 +0 15·35[a]	30·215	58·2
915	7 17 58·5	9 13·9	11 11·7	9 13·9	9 13·9	+4 55 +1 31·8		
1243	10 20 1	8 26·6	9 32·5	8 26·8	8 26·7	+3 40 +1 5·8		
1299	49 23·2	7 32·1	6 25·2	7 31·9	7 32·0	−2 20 −1 6·8		
1356	11 25 18·7	9 31·5	14 20·2	9 31·5	9 31·5	+2 55 +4 22·7		

[a] Advanced the minute hand of the chronometer 2^m.

JUNE 18TH, 1838, FACE OF SECTOR EAST (*continued*).

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
1378	11 44 56·5	9 7·5	8 33·1	9 7·2	9 7·35	+0 55 −0 8·25		
1433	12 19 59·5	8 20·2	11 26·3	8 20·2	8 20·2	−4 15 +3 6·1		
1527	....	8 27·8	7 1·7	8 27·6	8 27·7	−1 55 −1 26·0		
1562	13 36 46	9 5·2	3 25·7	9 4·8	9 5·0	+1 45 −5 13·3	30·200	58·2
1579	42 55·5	9 4·8	7 13·8	9 4·8	9 4·8	+1 45 −1 25·0		
1604	57 24·5	8 24·0	10 27·9	8 23·8	8 23·9	−1 40 +2 4·0		
1661	14 34 (1?)	9 15·3	13 2·7	9 15·1	9 15·2	−0 35 +3 21·5		
1742	15 13 4	9 23·5	8 1·7	9 23·5	9 23·5	−2 20 −1 21·8		
1774	29 2	10 13·0	11 33·2	10 12·8	10 12·9	+4 40 +1 20·3		
1797	40 57·2	9 23·3	5 18·4	9 23·1	9 23·2	+0 50 −4 4·8		
1821	49 38·5	9 15·3	9 5·3	9 15·3	9 15·3	−4 0 −0 10·0		
1835	56 13	8 30·3	7 12·2	8 30·4	8 30·35	−2 25 −1 18·15		
1866	....	8 27·1	8 21·2	8 27·1	8 27·1	+3 25 −0 5·9		
1889	16 21 4·5	10 3·4	9 23·5	10 3·4	10 3·4	−0 25 −0 13·9		
1915	39 57	9 22·0	11 9·4	9 21·8	9 21·9	−0 5 +1 21·5		
1947	54 26·7	8 31·3	12 29·2	8 31·5	8 31·4	0 0 +3 31·8		
1969	17 6 48·3	8 27·2	12 17·4	8 27·3	8 27·25	+1 25 +3 24·15		
2007	22 50·5	10 10·7	13 22·8	10 10·4	10 10·55	−3 5 +3 12·25		
2043	39 4	10 10·4	13 2·7	10 10·4	10 10·4	−3 5 +2 26·3	30·112	58
2079	55 41·5	10 24·5	11 11·3	10 24·5	10 24·5	+3 30 +0 20·8		
2101	18 6 54	10 4·7	5 20·7	10 4·5	10 4·6	−2 50 −4 17·9		
2110	13 40·2	10 11·7	7 14·4	10 11·5	10 11·6	−0 30 −2 31·2		
2741	48 56·5	10 12·0	14 3·1	10 12·0	10 12·0	+3 25 +3 25·1		

There is a deposit of damp on the inside or lower surface of the object-glass which cannot be removed without unscrewing the glass. It was dispersed for a time by applying my warm hand upon the glass with a warm cloth interposed, but it returned when the glass regained the temperature of the room. I am unwilling, as the weather is fine, to risk an alteration in the collimation by removing the glass. No doubt it arises from the dampness consequent upon so much rain, which has made its way into the tube.

June 19th, 1838, Face of Sector West.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
699	5 33 49·5	10 0·3	9 24·2	10 0·3	10 0·3	−0 15 +0 10·1	30·120	58
732	45 16·8	10 0·2	9 31·3	10 0·0	10 0·1	−1 55 +0 2·8		
791	6 14 7·5	9 25·7	9 18·3	9 25·7	9 25·7	+3 55 +0 7·4		
869	52 17·3	9 17·8	10 18·2	9 17·8	9 17·8	+5 10 −1 0·4		
903	7 11 26·5	9 26·5	7 15·8	9 26·4	9 26·45	−2 55 +2 10·65		
915	17 42·5	9 12·8	8 29·4	9 12·8	9 12·8	+4 55 +0 17·4		
957	39 30·2	10 17·8	10 8·5	10 17·8	10 17·8	−3 40 +0 9·3		
1243	....	8 33·4	9 8·2	8 33·3	8 33·35	+3 40 −0 8·85[a]		
1299	10 49 11·5	9 17·7	12 5·6	9 17·7	9 17·7	−2 20 −2 21·9		
1356	11 25 3·5	9 31·8	6 24·7	9 31·8	9 31·8	+2 55 +3 7·1		
1378	45 45·5	10 2·2	11 22·8	10 2·2	10 2·2	+0 55 −1 20·6		
1433	12 19 48	10 5·5	8 13·7	10 5·2	10 5·35	−4 15 +1 25·65		
1527	13 11 32·5	9 23·2	12 31·8	9 23·3	9 23·25	−1 55 −3 8·55		
1562	36 32	9 21·3	16 16·3	9 21·1	9 21·2	+1 45 −6 29·1		
1579	42 31·5	9 21·1	12 28·4	9 21·0	9 21·05	+1 45 −3 7·35	30·087	58
1604	57 12·5	10 4·4	9 17·4	10 4·2	10 4·3	−1 40 +0 20·9		
1661	14 33 48·5	10 5·6	7 32·2	10 5·6	10 5·6	−0 35 +2 7·4	30·100	59
1742	15 12 52·5	10 15·0	13 17·9	10 15·2	10 15·1	−2 20 −3 2·8		
1774	28 45·5	9 30·4	9 24·3	9 30·4	9 30·4	+4 40 +0 6·1		
1797	....	10 1·4	15 20·0	10 1·5	10 1·45	+0 50 −5 18·55[b]		
1866	....	11 2·3	12 24·3	11 2·3	11 2·3	+3 25 −1 22·0	30·140	59
1889	16 20 51·5	10 11·2	12 6·7	10 11·1	10 11·15	−0 25 −1 29·55		
1915	39 42	9 33·7	9 28·5	9 33·6	9 33·65	−0 5 +0 5·15[c]	30·142	59

[a] 10s past the middle wire. [b] About 15s past the middle wire. [c] The second of transit is uncertain.

Rain came on.

Shortly before this day's observations commenced, the quantity of vapour collected on the under surface of the object-glass was so great, that obviously the smaller stars could not be seen through it. Therefore it became necessary to remove the object-glass for the purpose of clearing it off, and to allow a stream of dry air to pass through the tube. This was accordingly done, and in replacing the glass it was screwed in with the same number of turns required in taking it out, and to a point marked on the brass previously. It is therefore probable that the collimation will not be altered.

JUNE 20TH, 1838, FACE OF SECTOR EAST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
699	5 33 50·5	9 31·2	11 21·0	9 31·2	9 31·2	−0 15 +1 23·8	30·250	59

Cloudy, with occasional showers.

JUNE 21ST, 1838, FACE OF SECTOR EAST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
957	7 39 21·5	10 3·6	11 27·8	10 3·4	10 3·5	−3 40 +1 24·3 [a]	30·430	58
1299	10 49 3·5	10 5·4	8 31·4	10 5·4	10 5·4	−2 20 −1 8·0		
1356	11 24 59	10 4·1	14 27·2	10 4·1	10 4·1	+2 55 +4 23·1		
1378	44 40	9 13·9	9 6·5	9 13·9	9 13·9	+0 55 −0 7·4		
1433	12 19 39·5	8 33·1	12 4·3	8 33·1	8 33·1	−4 15 +3 5·2		
1527	13 11 24·5	9 3·2	7 11·8	9 3·3	9 3·25	−1 55 −1 25·45		
1562	36 26	9 3·2	12 22·6	9 3·2	9 3·2	+1 40 +3 19·4		
1579	42 25·5	9 3·2	16 10·3	9 3·1	9 3·15	+1 40 +7 7·15		
1604	57 4·5	9 1·0	11 5·0	9 0·9	9 0·95	−1 40 +2 4·05	30·430	58
1661	14 33 41	8 32·6	12 21·3	8 32·7	8 32·65	−0 35 +3 22·65		
1742	15 12 43·5	9 1·6	7 14·3	9 1·6	9 1·6	−2 20 −1 21·3		
1774	28 51·5	9 21·2	11 9·4	9 21·2	9 21·2	+4 40 +1 22·2		
1797	40 37	9 18·1	5 14·6	9 18·2	9 18·15	+0 50 −4 3·55		
1821	49 17·5	9 15·9	9 5·8	9 15·8	9 15·85	−4 0 −0 10·05		
1835	55 52·5	9 17·8	8 0·3	9 17·6	9 17·7	−2 25 −1 17·4		
1889	16 20 43·5	....	10 12·1	10 26·7	....	−0 25 −0 14·6		
1915	39 36	10 1·3	11 23·4	10 1·1	10 1·2	−0 5 +1 22·2		
1947	55 5·5	10 2·8	14 0·0	10 2·8	10 2·8	0 0 +3 31·2		
1969	17 6 27·5	9 20·3	13 10·4	9 20·1	9 20·2	+1 25 +3 24·2		

[a] Cloudy at the transit of *α Columbæ*.

JUNE 21ST, 1838, FACE OF SECTOR EAST (*continued*).

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
2007	17 22 30·5	9 6·0	12 18·5	9 6·0	9 6·0	−3 5 +3 12·5		
2043	38 43·7	9 6·0	11 33·2	9 6·0	9 6·0	−3 5 +2 27·2		
2079	55 21	9 3·3	9 25·0	9 3·4	9 3·35	+3 30 +0 21·65		
2101	18 6 33	9 0·0	4 16·8	8 33·5	8 33·75	−2 50 −4 16·95	30·430	57·6
2110	13 10	9 19·8	6 22·6	9 19·8	9 19·8	−0 30 −2 31·2		
2741	22 48 35·5	9 33·0	13 24·6	9 33·0	9 33·0	+3 25 +3 25·6	30·400	56·6

The past has been a good observing night.

JUNE 22ND, 1838, FACE OF SECTOR WEST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
732	....	10 20·3	10 16·3	10 20·2	10 20·25	−1 55 +0 3·95	30·400	57
791	....	10 4·7	9 30·0	10 4·8	10 4·75	+3 55 +0 8·75		
848	6 43 27·5	9 28·9	9 7·2	9 28·9	9 28·9	+1 35 +0 21·7	30·400	57·5
869	51 55·2	9 22·2	10 22·3	9 22·4	9 22·3	+5 10 −1 0·0 [a]		
903	....	10 15·6	8 5·2	10 15·6	10 15·6	−2 55 +2 10·4		
915	7 17 14	10 19·6	10 0·7	10 19·6	10 19·6	+4 55 +0 18·9 [b]		
957	39 12	10 31·4	10 20·1	10 31·4	10 31·4	−3 40 +0 11·3		
1061	8 33 25	10 20·7	9 20·3	10 20·7	10 20·7	−0 50 +1 0·4		
1299	....	10 27·7	13 15·2	10 27·5	10 27·6	−2 20 −2 21·6 [c]		
1356	11 24 39·5	10 17·3	7 9·2	10 17·3	10 17·3	+2 55 +3 8·1		
1378	44 22·5	11 3·3	12 23·3	11 3·0	11 3·15	+0 55 −1 20·15	30·350	58
1433	12 19 29·5	10 2·7	8 12·6	10 3·5	10 3·1	−4 15 +1 24·5		
1562	....	9 12·8	7 10·2	9 12·8	9 12·8	+1 40 +2 2·6		
1579	13 42 8	9 12·8	3 22·6	9 12·8	9 12·8	+1 40 +5 24·2		

[a] Before this transit moved the sector easterly a small quantity.

[b] After this transit moved the sector in azimuth to the former position.

[c] This star was not detected until near leaving the field, but the observation is good.

JUNE 22ND, 1838, FACE OF SECTOR WEST (*continued*).

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
1604	13 56 51·5	9 14·8	8 27·4	9 14·7	9 14·75	−1 40 +0 21·35		
1661	14 33 36·2	9 13·0	7 5·0	9 12·6	9 12·8	−0 35 +2 7·8		
1742	15 12 31·2	9 15·7	12 18·1	9 15·8	9 15·75	−2 20 −3 2·35		
1774	28 19·2	9 7·2	9 1·0	9 7·4	9 7·3	+4 40 +0 6·3		
1797	40 20	9 15·7	14 33·0	9 15·7	9 15·7	+0 50 −5 17·3		
1835	55 40·5	9 29·7	12 29·0	9 29·7	9 29·7	−2 25 −2 33·3 [d]		
1889	16 20 29·5	9 21·5	11 18·5	9 21·7	9 21·6	−0 25 −1 30·9		
1915	....	9 20·9	9 16·3	9 20·9	9 20·9	−0 5 +0 4·6	30·353	56
1969	17 6 10·5	7 11·3	5 2·3	7 11·0	7 11·15	+1 25 +2 8·85		
2007	22 19·5	7 23·0	5 25·7	7 23·1	7 23·05	−3 5 +1 31·35 [e]		
2043	38 32	7 23·1	6 12·2	7 23·0	7 23·05	−3 5 +1 10·85 [f]		
2079	55 0·5	8 3·0	8 33·4	8 3·4	8 3·2	+3 30 −0 30·2		
2101	18 6 21·5	9 0·4	15 0·1	9 0·4	9 0·4	−2 50 −5 33·7		
2110	13 5	9 2·7	13 15·4	9 3·2	9 2·95	−0 30 −4 12·45	30·350	56·2
2741	22 48 15·2	8 26·2	6 15·4	8 26·1	8 26·15	+2 25 +2 10·75		

[d] Vapour is again deposited on the lower surface of the object-glass.
[e] Opened the hole in the tube occupied by the reflector, to let in air. [f] Faint.

Several stars this night were barely visible, and some were lost, from the quantity of aqueous vapour on the under surface of the object-glass. The opening in the roof of the building is close to the object-glass, and the entrance door is kept open to equalise the temperature, yet the quantity of vapour does not diminish.

JUNE 23RD, 1838, FACE OF SECTOR EAST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
699	....	9 11·1	11 2·8	9 11·1	9 11·1	−0 15 +1 25·7[a]		
732	5 44 51·5	9 15·3	10 33·5	9 15·4	9 15·35	−1 55 +1 18·15	30·335	56·6
791	6 13 46	10 17·7	12 5·3	10 17·3	10 17·5	+3 55 +1 21·8		
848	43 26	10 17·0	12 19·1	10 17·2	10 17·1	+1 35 +2 2·0		
869	51 56·5	10 17·0	10 31·0	10 16·8	10 16·9	+5 10 +0 14·1		
903	7 11 1	10 0·3	13 26·0	10 0·3	10 0·3	−2 55 +3 25·7		
915	....	10 23·6	12 22·2	10 23·7	10 23·65	+4 55 +1 32·55[b]		
957	39 4	9 21·2	11 11·4	9 21·1	9 21·15	−3 40 +1 24·25		
1243	10 19 23	9 33·1	11 4·3	9 33·1	9 33·1	+3 40 +1 5·2		
1299	48 45·8	9 14·4	8 7·4	9 14·4	9 14·4	−2 20 −1 7·0		
1356	11 24 40·5	9 26·3	14 13·5	9 26·2	9 26·25	+2 55 +4 21·25		
1378	44 21·5	9 21·7	9 13·8	9 21·7	9 21·7	+0 55 −0 7·9[c]		
1433	12 19 22	9 10·7	12 15·4	9 10·7	9 10·7	−4 15 +3 4·7		
1527	13 11 6·5	8 18·6	6 24·8	8 18·5	8 18·55	−1 55 −1 27·75		
1562	36 7·5	8 29·8	3 14·5	8 29·8	8 29·8	+1 45 −5 15·3		
1579	42 7	8 29·8	7 3·0	8 29·7	8 29·75	+1 45 −1 26·75		
1604	56 46·5	8 9·7	10 12·1	8 9·7	8 9·7	−1 40 +2 2·4	30·315	56·1
1661	14 33 22·5	8 8·4	11 29·7	8 8·5	8 8·45	−0 35 +3 21·25		
1742	15 12 25	8 24·2	7 1·2	8 24·2	8 24·2	−2 20 −1 23·0[d]		
1774	28 22·5	8 32·8	10 19·7	8 32·8	8 32·8	+4 40 −1 20·9		
1797	40 18	9 3·2	4 33·0	9 3·4	9 3·3	+0 50 −4 4·3		
1821	48 59	9 5·5	8 28·8	9 5·3	9 5·4	−4 0 −0 10·6		
1835	55 33·5	8 32·4	7 13·9	8 32·4	8 32·4	−2 25 −1 18·5		
1889	16 20 25·5	9 25·5	9 10·3	9 25·5	9 25·5	−0 25 −0 15·2		
1915	39 17·5	9 26·2	11 13·3	9 26·2	9 26·2	−0 5 +1 21·1		
1969	17 6 9·5	10 0·8	13 24·6	10 1·0	10 0·9	+1 25 +3 23·7		
2007	22 12	9 9·8	12 22·3	9 9·8	9 9·8	−3 5 +3 12·5		

[a] Faint; obliged to remove the object-glass.
[b] 15s past the middle wire.
[c] Moved the sector a little in azimuth, eastward.
[d] Vapour is becoming deposited on the object-glass.

JUNE 23RD, 1838, FACE OF SECTOR EAST (*continued*).

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
2043	17 38 25	9 9·8	12 1·4	9 9·8	9 9·8	−3 5 +2 25·6		
2079	55 2·5	10 1·8	10 23·8	10 2·4	10 2·1	+3 30 +0 21·7		
2101	18 6 15	8 7·8	3 23·5	8 8·0	8 7·9	−2 50 −4 18·4		
2110	13 1·5	8 16·3	5 18·4	8 16·4	8 16·35	−0 30 −2 31·95	30·330	56
2741	22 48 15·5	8 29·7	12 19·7	8 29·7	8 29·7	+3 25 +3 24·0		

It became absolutely necessary to remove the object-glass immediately after the transit of *α Columbæ,* from the dense collection of vapour settled on its under surface. It was restored in the same manner and with the precautions adopted on Tuesday the 19th.

JUNE 24TH, 1838, FACE OF SECTOR WEST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
699	....	8 8·8	7 31·2	8 8·6	8 8·7	−0 15 +0 11·5	30·332	56·2
732	5 44 36·5	8 26·3	8 21·5	8 26·1	8 26·2	−1 55 +0 4·7		
791	6 13 22·5	8 14·4	8 5·1	8 14·3	8 14·35	+3 55 +0 9·25		
848	43 6	8 20·3	7 31·1	8 20·0	8 20·15	+1 35 +0 23·05		
869	51 31·5	8 16·4	9 14·3	8 16·3	8 16·35	+5 10 −0 31·95		
903	....	8 27·8	6 14·7	8 27·6	8 27·7	−2 55 +2 13·0		
915	7 16 56·5	8 24·8	8 5·8	8 24·8	8 24·8	+4 55 +0 19·0		
957	38 51	9 10·1	8 31·7	9 9·8	9 9·95	−3 40 +0 12·25		
1061	8 33 5	9 10·3	8 8·8	9 10·3	9 10·3	−0 50 +1 1·5[a]		
1243	....	8 28·7	9 2·7	8 28·7	8 28·7	+3 40 −0 8·0	30·320	57·5
1356	11 24 19·5	8 32·8	5 24·7	8 32·8	8 32·8	+2 55 +3 8·1		
1378	44 3	9 6·2	10 26·7	9 6·4	9 6·3	+0 55 −1 20·4		
1433	12 19 9·5	9 19·8	7 28·4	9 19·9	9 19·85	−4 15 +1 25·45	30·320	57·5

[a] Very faint.

JUNE 24TH, 1838, FACE OF SECTOR WEST (*continued*).

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
1527	13 10 51·5	9 16·3	12 24·8	9 16·3	9 16·3	−1 55 −3 8·5		
1562	35 48·5	8 32·6	15 27·1	8 32·6	8 32·6	+1 45 −6 28·5		
1579	41 48·2	8 32·6	12 4·7	8 32·6	8 32·6	+1 45 −3 6·1		
1604	56 36	9 7·1	8 19·7	9 7·3	9 7·2	−1 40 +0 21·5		
1661	14 33 6·5	9 7·6	6 33·9	9 7·6	9 7·6	−0 35 +2 7·7		
1742	15 12 11·5	9 8·7	12 10·6	9 8·6	9 8·65	−2 20 −3 1·95		
1774	28 0	9 5·5	8 32·4	9 5·4	9 5·45	+4 40 +0 7·05		
1797	40 0·5	8 33·4	14 17·2	8 33·4	8 33·4	+0 50 −5 17·8		
1821	48 47·5	9 21·3	11 11·2	9 21·3	9 21·3	−4 0 −1 23·9		
1835	55 20·2	9 23·1	12 21·1	9 23·0	9 23·05	−2 25 −2 32·05	30·320	57
1866	16 8 36	9 8·7	10 29·4	9 8·6	9 8·65	+3 25 −1 20·75		
1889	20 9·5	9 12·3	11 7·2	9 12·3	9 12·3	−0 25 −1 28·9 [b]		
1915	39 1·5	9 10·7	9 4·2	9 10·6	9 10·65	−0 5 +0 6·45		
1947	53 30·5	9 9·3	6 28·4	9 9·3	9 9·3	0 0 +2 14·9		
1969	17 5 51	9 5·7	6 29·8	9 5·6	9 5·65	+1 25 +2 9·85		
2007	21 59·5	9 23·0	7 25·0	9 22·9	9 22·95	−3 5 +1 31·95		
2043	38 12·5	9 22·9	8 10·5	9 22·9	9 22·9	−3 5 +1 12·4		
2079	54 41·5	9 14·8	10 8·5	9 14·9	9 14·85	+3 30 −0 27·65		
2101	18 6 2	9 29·2	15 28·3	9 29·2	9 29·2	−2 50 −5 33·1		
2110	12 45·5	9 27·1	14 4·7	9 27·1	9 27·1	−0 30 −4 11·6	30·320	57

[b] Beautiful.

A fine observing night; the stars very steady; no vapour on the object-glass.

Although *α Columbæ* (No. 699) transits before noon, it is entered a day later for convenience of arrangement.

JUNE 25TH, 1838, FACE OF SECTOR EAST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
699	5 33 5·5	9 16·6	11 7·4	9 16·6	9 16·6	−0 15 +1 24·8 [a]	30·320	59
732	44 12·5	....	10 29·1	9 9·3	....	−1 55 +1 19·8		
848	6 43 7	9 5·7	11 8·3	9 5·7	9 5·7	+1 35 +2 2·6		
869	51 38·5	9 7·2	9 22·7	9 7·2	9 7·2	+5 10 +0 15·5	30·300	61
903	7 10 41	9 5·6	12 32·3	9 5·7	9 5·65	−2 55 +3 26·65		
915	17 2·5	9 24·7	11 23·5	9 24·7	9 24·7	+4 55 +1 32·8 [b]		
1061	8 33 2·5	9 8·4	11 21·1	9 8·4	9 8·4	−0 50 +2 12·7		
1243	10 19 5·5	9 19·5	10 25·6	9 19·7	9 19·6	+3 40 +1 6·0		
1356	11 24 21 or 23	9 24·6	14 13·3	9 24·5	9 24·55	+2 55 +4 22·75		
1378	44 3	9 25·7	9 18·4	9 25·7	9 25·7	+0 55 −0 7·3		
1433	12 19 2	9 21·7	12 27·2	9 21·8	9 21·75	−4 15 +3 5·45		
1527	13 10 47·5	9 28·5	8 1·5	9 28·5	9 28·5	−1 55 −1 27·0	30·287	60
1562	35 49·5	10 2·1	4 22·0	10 2·0	10 2·05	+1 45 −5 14·05		
1579	41 49·5	10 2·0	8 9·6	10 1·9	10 1·95	+1 45 −1 26·35		
1604	56 27·5	9 1·0	11 3·8	9 1·1	9 1·05	−1 40 +2 2·75		
1661	14 33 4·5	9 18·5	13 5·5	9 18·7	9 18·6	−0 35 +3 20·9		
1742	....	9 12·2	7 24·1	9 12·0	9 12·1	−2 20 −1 22·0		
1774	15 28 55	9 25·8	11 12·1	9 25·8	9 25·8	+4 40 +1 20·3		
1821	48 40·5	8 26·7	8 16·4	8 26·7	8 26·7	−4 0 −0 10·3		
1835	54 15·5	....	7 13·3	8 31·2	....	−2 25 −1 17·9		
1866	16 8 39·5	9 25·0	9 17·4	9 25·0	9 25·0	+3 25 −0 7·6		
1889	20 7	9 33·8	9 17·2	9 33·8	9 33·8	−0 25 −0 16·6		
1915	38 59·5	9 23·0	11 9·2	9 23·2	9 23·1	−0 5 +1 20·1		
1947	53 29	9 22·3	13 17·8	9 22·3	9 22·3	0 0 +3 29·5		
1969	17 5 51	9 26·7	13 15·2	9 26·7	9 26·7	+1 25 +3 22·5		
2007	21 53	9 31·7	13 8·4	9 31·7	9 31·7	−3 5 +3 10·7		
2043	38 6·5	9 31·7	12 22·7	9 31·8	9 31·75	−3 5 +2 24·95		
2079	54 45	10 2·7	10 22·9	10 2·6	10 2·65	+3 30 +0 20·25		
2101	18 5 56·5	9 26·1	5 5·5	9 26·1	9 26·1	−2 50 −4 20·6		
2110	12 43	9 24·2	6 24·3	9 24·0	9 24·1	−0 30 −2 33·8	30·265	59

[a] South-east end.

[b] No. 957 must have escaped unseen behind the wire.

June 26th, 1838, Face of Sector West.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
699	5 32 52·5	9 7·7	8 29·8	9 7·7	9 7·7	—0 15 +0 11·9	30·238	59
732	44 21	9 9·1	9 3·2	9 9·2	9 9·15	—1 55 +0 5·95		
791	6 13 8	9 7·8	8 32·3	9 7·6	9 7·7	+3 55 +0 9·4		
869	51 17	8 32·7	9 30·4	8 32·8	8 32·75	+5 10 —0 31·65		
903	....	9 24·8	7 11·7	9 24·8	9 24·8	—2 55 +2 13·1		
915	7 16 42·5	9 15·3	8 28·7	9 15·5	9 15·4	+4 55 +0 20·7[a]		
1061	8 32 50·5	10 4·2	9 1·4	10 4·2	10 4·2	—0 50 +1 2·8	30·230	60
1243	....	9 25·3	9 32·2	9 25·3	9 25·3	+3 40 —0 6·9[b]		
1299	10 48 16·5	10 8·2	12 27·9	10 8·1	10 8·15	—2 20 —2 19·75		
1356	11 24 5·5	9 24·2	6 15·1	9 24·2	9 24·2	+2 55 +3 9·1		
1378	43 48·5	9 12·8	10 31·2	9 12·8	9 12·8	+0 55 —1 18·4		
1433	12 18 54	9 29·7	8 3·5	9 29·8	9 29·75	—4 15 +1 26·25		
1527	13 10 37	9 30·0	13 3·8	9 30·0	9 30·0	—1 55 —3 7·8		
1562	35 34	9 10·3	16 3·4	9 10·3	9 10·3	+1 45 —6 27·1		
1579	41 33·5	9 10·3	12 15·6	9 10·3	9 10·3	+1 45 —3 5·3		
1604	56 16·5	9 21·0	9 32·3	9 21·0	9 21·0	—1 40 —0 11·3[c]		
1661	14 32 52	9 20·1	7 11·4	9 20·1	9 20·1	—0 35 +2 8·7		
1742	15 11 56·5	9 12·6	12 14·5	9 12·7	9 12·65	—2 20 —3 1·85		
1797	39 45·5	9 2·0	14 18·3	9 2·1	9 2·05	+0 50 —5 16·25		
1821	48 32·5	9 25·2	11 15·6	9 24·8	9 25·0	—4 0 —1 24·6		
1835	55 5	9 20·7	12 19·2	9 20·5	9 20·6	—2 25 —2 32·6		
1866	16 8 21·5	9 0·3	10 19·7	9 0·3	9 0·3	+3 25 —1 19·4		
1889	19 54	9 6·0	11 0·7	9 6·5	9 6·25	—0 25 —1 28·45		
1915	38 46·5	9 9·3	9 3·2	9 9·3	9 9·3	—0 5 +0 6·1		
1969	17 6(5?) 36·5	10 0·0	7 22·6	10 0·0	10 0·0	+1 25 +2 11·4	30·230	59
2007	21 44·5	10 28·6	8 31·3	10 28·7	10 28·65	—3 5 +1 31·35		
2043	37 57	10 28·7	9 16·6	10 28·7	10 28·7	—3 5 +1 12·1		
2079	54 27	10 7·8	11 0·8	10 7·8	10 7·8	+3 30 —0 27·0		
2101	18 5 47	10 25·3	16 24·4	10 25·3	10 25·3	—2 50 —5 33·1		
2110	12 30·5	10 26·1	15 3·5	10 26·1	10 26·1	—0 30 —4 11·4		

[a] Flickering images. [b] Very faint.

[c] An error committed in the reading for the star; most probably the micrometer for the star was $8^{rev}\,32^{pts}\cdot3$, and the zenith distance $-1^{\circ}\,40' + 22^{pts}\cdot7$; the reading being near *Zero*, the revolution next to coincidence catches the eye.

A beautiful observing night; the stars surrounded by rings; the centre of the image a small orange nucleus.

JUNE 27TH, 1838, FACE OF SECTOR EAST.

No. of Ast. Soc. Cat.	Time by Chronometer.	Micr. for Plumb-line on Dot.	Micr. for Observation of Star.	Micr. for Plumb-line on Dot.	Mean of Micr. for Plumb-line on Dot.	Star's Apparent Zenith Distance.	Barom.	Therm.
	h m s	rev. pts.	rev. pts.	rev. pts.	rev. pts.	° ′ rev. pts.	in.	°
869	6 51 24·5	10 29·5	10 30·0	10 29·5	10 29·5	+5 10 +0 0·5[a]		
957	....	....	12 23·8	10 32·5	....	−3 40 +1 25·3[b]	30·146	61
1243	10 18 48	10 28·7	12 0·7	10 28·8	10 28·75	+3 40 +1 5·95		
1299	....	9 14·6	8 8·7	9 14·4	9 14·5	−2 20 −1 5·8[c]		
1356	11 24 6·5	9 26·3	14 13·7	9 26·4	9 26·35	+2 55 +4 21·35		
1378	43 47·5	9 27·5	9 19·7	9 27·4	9 27·45	+0 55 −0 7·75		
1433	....	9 8·4	12 13·3	9 8·0	9 8·2	−4 15 +3 5·1		
1527	13 10 33	8 27·8	6 33·7	8 27·8	8 27·8	−1 55 −1 28·1		
1579	41 33·5	9 3·8	7 11·1	9 3·6	9 3·7	+1 45 −1 26·6		
1604	56 13	9 8·4	11 9·8	9 8·3	9 8·35	−1 40 +2 1·45		
1661	14 32 50	9 20·3	13 5·7	9 20·3	9 20·3	−0 35 +3 19·4	30·145	60·8
1774	15 27 48·5	10 8·6	11 28·4	10 8·6	10 8·6	+4 40 +1 19·8		
1797	39 44·5	10 11·8	6 6·7	10 11·8	10 11·8	+0 50 −4 5·1		
1821	48 26	10 32·4	10 21·1	10 32·5	10 32·45	−4 0 −0 11·35		
1835	55 1	10 16·5	8 31·8	10 16·3	10 16·4	−2 25 −1 18·6	30·145	60·8
1866	16 8 23	10 26·2	10 18·8	10 26·4	10 26·3	+3 25 −0 7·5		
1889	19 51·5	10 25·0	10 7·5	10 24·6	10 24·8	−0 25 −0 17·3		
1915	38 45	10 20·8	12 7·3	10 20·8	10 20·8	−0 5 +1 20·5[d]		
1947	53 13·5	10 13·7	14 9·0	10 13·7	10 13·7	−0 0 +3 29·3		
1969	17 5 35·5	10 12·8	14 1·6	10 12·8	10 12·8	+1 25 +3 22·8[e]		
2007	21 38	9 23·8	12 33·5	9 23·8	9 23·8	−3 5 +3 9·7		
2043	37 51	9 23·8	12 14·5	9 23·7	9 23·75	−3 5 +2 24·75		
2079	54 28	10 4·3	10 24·7	10 4·5	10 4·4	+3 30 +0 20·3		
2101	18 5 40·5	9 12·0	4 25·8	9 11·8	9 11·9	−2 50 −4 20·1		
2110	12 27·5	9 15·0	6 14·8	9 14·8	9 14·9	−0 30 −3 0·1	30·080	60

[a] There must be some error in reading off the micrometer for the star.
[b] The sector axis has been deranged since last night.
[c] 12[s] past the middle wire.
[d] The stars are flickering and difficult to bisect; south wind.
[e] The wind is south.

A change took place in the verticality of the sector since last night: adjusted it. The plummet was sluggish: I introduced clean water; then re-examined the adjustments.

JUNE 28TH, 1838, FACE OF SECTOR EAST.

Examination for Runs.

Arch to the Left.			Arch to the Left.			Arch to the Left.		
° ′	rev. pts.	rev. pts.	° ′	rev. pts.	rev. pts.	° ′	rev. pts.	rev. pts.
0 10	4 10·4		0 50	4 9·4		1 20	4 9·2	
		17 28·0			17 29·0			17 29·2
0	22 4·4		40	22 4·4		1 10	22 4·4	
		17 28·2			17 29·6			17 29·0
10	4 10·2		50	4 8·8		1 20	4 9·4	
		17 28·2			17 29·0			17 28·9
0	22 4·4		40	22 3·8		1 10	22 4·3	
		17 28·1			17 28·4			17 29·0
10	4 10·3		50	4 9·4		1 20	4 9·3	
		17 28·2			17 28·1			17 29·0
0	22 4·5		40	22 3·5		1 10	22 4·3	
	Mean =	17 28·14		Mean =	17 28·82		Mean =	17 29·02
			1 0	4 12·3				
					17 29·1			
0 20	4 10·8		50	22 7·4		1 20	22 8·3	
		17 28·9			17 29·0			17 28·9
10	22 5·7		1 0	4 12·4		1 30	4 13·4	
		17 29·0			17 28·8			17 28·6
20	4 10·7		50	22 7·2		1 20	22 8·0	
		17 28·9			17 28·9			17 28·6
10	22 5·6		1 0	4 12·3		1 30	4 13·4	
		17 28·9			17 28·7			17 28·4
20	4 10·7		50	22 7·0		1 20	22 7·8	
		17 28·9						17 28·6
10	22 5·6			Mean =	17 28·90	1 30	4 13·2	
	Mean =	17 28·92					Mean =	17 28·62
			1 0	22 5·5				
					17 28·7			
			1 10	4 10·8				
					17 28·6			
0 30	4 10·4		1 0	22 5·4		1 30	22 2·3	
		17 28·3			17 30·0			17 29·1
20	22 4·7		1 10	4 9·4		1 40	4 7·2	
		17 28·4			17 29·4			17 29·1
30	4 10·3		1 0	22 4·8		1 30	22 2·3	
		17 28·4			17 30·4			17 29·0
20	22 4·7		1 10	4 8·4		1 40	4 7·3	
		17 28·3						17 28·8
30	4 10·4			Mean =	17 29·42	1 30	22 2·1	
		17 28·2						17 28·9
20	22 4·6					1 40	4 7·2	
	Mean =	17 28·32	The last ing out introdu	repeated the bob- cing clean	after clean- cistern and water.		Mean =	17 28·98
0 40	4 10·4		1 10	22 6·8		1 40	22 9·0	
		17 28·8			17 29·5			17 29·3
30	22 5·2		1 0	4 11·3		1 50	4 13·7	
		17 29·0			17 29·5			17 29·4
40	4 10·2		1 10	22 6·8		1 40	22 9·1	
		17 29·1			17 29·1			17 28·9
30	22 5·3		1 0	4 11·7		1 50	4 14·2	
		17 29·0			17 28·9			17 29·0
40	4 10·3		1 10	22 6·6		1 40	22 9·2	
		17 28·8			17 29·1			17 29·0
30	22 5·1		1 0	4 11·5		1 50	4 14·2	
	Mean =	17 28·94		Mean =	17 29·22		Mean =	17 29·12

Examination for Runs (continued).

Arch to the Left.			Arch to the Right.			Arch to the Right.		
° ′	rev. pts.	rev. pts.	° ′	rev. pts.	rev. pts.	° ′	rev. pts.	rev. pts.
1 50	22 2·1	17 28·6	5 10	23 3·4	17 28·2	2 0	22 2·7	17 29·0
2 0	4 7·5	17 28·8	5 0	5 9·2	17 28·2	1 50	4 7·7	17 29·0
1 50	22 2·3	17 29·0	5 10	23 3·4	17 28·4	2 0	22 2·7	17 29·0
2 0	4 7·3	17 28·2	5 0	5 9·0	17 28·4	1 50	4 7·7	17 29·0
1 50	22 1·5	17 28·2	5 10	23 3·4	17 28·4	2 0	22 2·7	17 29·1
2 0	4 7·3		5 0	5 9·0		1 50	4 7·6	
	Mean =	17 28·56		Mean =	17 28·32		Mean =	17 29·02
				Repeated.				
3 20	4 10·9	17 29·1	5 0	3 33·7	17 29·0	0 10	21 31·7	17 29·8
3 10	22 6·0	17 29·1	5 10	21 28·7	17 29·3	0 0	4 1·9	17 29·4
3 20	4 10·9	17 28·8	5 0	3 33·4	17 28·9	0 10	21 31·3	17 29·6
3 10	22 5·7	17 28·7	5 10	21 28·3	17 28·5	0 0	4 1·7	17 29·4
3 20	4 11·0	17 28·7	5 0	3 33·8	17 28·5	0 10	21 31·1	17 29·6
3 10	22 5·7		5 10	21 28·3		0 0	4 1·5	
	Mean =	17 28·88		Mean =	17 28·84		Mean =	17 29·56
5 0	22 9·3	17 28·7	3 20	22 6·3	17 29·5			
5 10	4 14·6	17 28·8	3 10	4 10·8	17 29·5			
5 0	22 9·4	17 28·7	3 20	22 6·3	17 29·3			
5 10	4 14·7	17 28·8	3 10	4 11·0	17 29·2			
5 0	22 9·5	17 28·7	3 20	22 6·2	17 29·3			
5 10	4 14·8		3 10	4 10·9				
	Mean =	17 28·74		Mean =	17 29·36			

The mean of the whole = 17 rev. 28·885 pts. for 10′ of the Arch.

$$\therefore\ 1 \text{ rev.} = \frac{600 \times 34}{606{\cdot}885} = 33''{\cdot}6143 \text{ of the Arch.}$$

This value is almost identical with the value obtained at Klyp Fonteyn.

Throughout the examination the thermometer stood at 61°.

Table for Converting the Micrometer Readings into Minutes and Seconds of the Arch.

Pts.	$0^{rev.}$	$1^{rev.}$	$2^{rev.}$	$3^{rev.}$	$4^{rev.}$	$5^{rev.}$	$6^{rev.}$
	″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″
0	0	33·614	1 7·229	1 40·843	2 14·457	2 48·072	3 21·686
1	0·989	34·603	1 8·217	1 41·832	2 15·446	2 49·060	3 22·674
2	1·977	35·592	1 9·206	1 42·820	2 16·435	2 50·049	3 23·663
3	2·966	36·580	1 10·195	1 43·809	2 17·423	2 51·037	3 24·652
4	3·955	37·569	1 11·183	1 44·798	2 18·412	2 52·026	3 25·640
5	4·943	38·558	1 12·172	1 45·786	2 19·401	2 53·015	3 26·629
6	5·932	39·546	1 13·161	1 46·775	2 20·389	2 54·003	3 27·618
7	6·921	40·535	1 14·149	1 47·764	2 21·378	2 54·992	3 28·606
8	7·909	41·524	1 15·138	1 48·752	2 22·366	2 55·981	3 29·595
9	8·898	42·512	1 16·126	1 49·741	2 23·355	2 56·969	3 30·584
10	9·887	43·501	1 17·115	1 50·730	2 24·344	2 57·958	3 31·572
11	10·875	44·490	1 18·104	1 51·718	2 25·332	2 58·947	3 32·561
12	11·864	45·478	1 19·092	1 52·707	2 26·321	2 59·935	3 33·550
13	12·853	46·467	1 20·081	1 53·695	2 27·310	3 0·924	3 34·538
14	13·841	47·456	1 21·070	1 54·684	2 28·298	3 1·913	3 35·527
15	14·830	48·444	1 22·058	1 55·673	2 29·287	3 2·901	3 36·516
16	15·818	49·433	1 23·047	1 56·661	2 30·276	3 3·890	3 37·504
17	16·807	50·421	1 24·036	1 57·650	2 31·264	3 4·879	3 38·493
18	17·796	51·410	1 25·024	1 58·639	2 32·253	3 5·867	3 39·482
19	18·784	52·399	1 26·013	1 59·627	2 33·242	3 6·856	3 40·470
20	19·773	53·387	1 27·002	2 0·616	2 34·230	3 7·845	3 41·459
21	20·762	54·376	1 27·990	2 1·605	2 35·219	3 8·833	3 42·448
22	21·750	55·365	1 28·979	2 2·593	2 36·208	3 9·822	3 43·436
23	22·739	56·353	1 29·968	2 3·582	2 37·196	3 10·811	3 44·425
24	23·728	57·342	1 30·956	2 4·571	2 38·185	3 11·799	3 45·413
25	24·716	58·331	1 31·945	2 5·559	2 39·174	3 12·788	3 46·402
26	25·705	59·319	1 32·934	2 6·548	2 40·162	3 13·777	3 47·391
27	26·694	1 0·308	1 33·922	2 7·537	2 41·151	3 14·765	3 48·379
28	27·682	1 1·297	1 34·911	2 8·525	2 42·140	3 15·754	3 49·368
29	28·671	1 2·285	1 35·900	2 9·514	2 43·128	3 16·742	3 50·357
30	29·660	1 3·274	1 36·888	2 10·503	2 44·117	3 17·731	3 51·345
31	30·648	1 4·263	1 37·877	2 11·491	2 45·105	3 18·720	3 52·334
32	31·637	1 5·251	1 38·866	2 12·480	2 46·094	3 19·708	3 53·323
33	32·626	1 6·240	1 39·854	2 13·469	2 47·083	3 20·697	3 54·311
34	33·614	1 7·229	1 40·843	2 14·457	2 48·072	3 21·686	3 55·300

§ 12. Collection of all the Results of Observation of each Star at Klyp Fonteyn, and Deduction of Mean Zenith Distance, 1838, January 0.

Note.—The Reduction for Azimuthal Error is always to be applied subtractively to the Zenith Distance. The Refraction is always to be applied additively. The Precession, Aberration, and Nutation, have the sign which is proper for reducing the Apparent South Polar Distance of the Star to its Mean South Polar Distance, 1838, Jan. 0; and therefore are to be applied with the sign given in the Table when the star is North of the Zenith, and with the opposite sign when the star is South of the Zenith.

The numbers included in parentheses in the column " Mean Zenith Distance, 1838, Jan. 0," are omitted in taking the mean. Where an asterisk is affixed to the Day of observation it denotes that there is some circumstance affecting the value of the observation for which it will be necessary to refer to the section of Unreduced Observations.

Star's No. in Ast. Soc. Cat., Name, and Position with regard to the Zenith.	Face of Sector East.					
	Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.
A. S. C. 699,	April 5	1° 27′ 21″·96	0″·47	1″·42	+ 6″·42	1° 27′ 16″·49
α Columbæ,	10	25·47	0·01	1·37	5·88	20·95
South.	21	22·40	0·01	1·38	+ 4·32	19·45
					Mean	1 27 18·96
A. S. C. 732,	April 10	3 7 31·76	0·02	2·93	+ 6·52	3 7 28·15
β Columbæ,	21	29·00	0·02	2·96	+ 5·07	26·87
South.						
					Mean	3 7 27·51
A. S. C. 791,	Mar. 30	2 42 35·21	4·77	2·59	+ 7·00	2 42 40·03
ζ Canis Majoris,	April 1	40·76	7·04	2·59	6·93	43·24
North.	5	36·51	0·82	2·62	6·73	45·04
	10	35·32	0·01	2·53	6·42	44·26
	16	36·31	0·19	2·54	+ 5·89	44·55
					Mean	2 42 43·42
A. S. C. 848,	Mar. 30	0 22 49·66	0·67	0·36	+ 8·10	0 22 57·45
κ Canis Majoris,	April 1	47·88	1·00	0·36	8·09	55·33
North.	5	49·66	0·12	0·36	8·02	57·92
	9	49·86	0·00	0·35	7·87	58·08
	10	48·67	0·00	0·35	+ 7·84	56·86
					Mean	0 22 57·13

Face of Sector West.						Resulting Error of Collimation.	Resulting Mean Zenith Distance, 1838, Jan. 0, completely corrected; and Position with regard to the Zenith.
Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.		
	° ′ ″	″	″	″	° ′ ″	″	° ′ ″
April 4*	1 28 25·73	0·00	1·41	+ 6·52	1 28 20·56		
6	24·59	0·00	1·39	6·32	19·66	30·28	1 27 49·24 South.
20*	21·53	0·02	1·39	+ 4·49	18·31		
				Mean	1 28 19·51		
Mar. 31	3 8 44·27	9·20	2·96	+ 7·42	3 8 30·61		
April 4	32·87	0·00	3·01	7·11	28·77		
11*	29·11	0·04	3·04	6·43	(25·68)	30·97	3 7 58·48 South.
15	32·47	0·30	3·06	5·94	29·29		
20	31·38	0·04	2·98	+ 5·23	29·09		
				Mean	3 8 29·44		
Mar. 31	2 41 45·15	7·42	2·55	+ 6·96	2 41 47·24		
April 4	37·23	0·00	2·59	6·80	46·62		
6	35·80	0·01	2·59	6·68	45·06		
11*	37·14	0·03	2·62	6·33	46·15	28·72	2 42 14·70 North.
15	37·83	0·24	2·64	5·98	46·21		
20	36·60	0·03	2·57	+ 5·46	44·60		
				Mean	2 41 45·98		
April 4	0 21 50·93	0·00	0·36	+ 8·05	0 21 59·34		
6	50·73	0·00	0·36	8·00	59·09		
11	50·93	0·00	0·36	7·78	59·07		
15	50·83	0·03	0·36	+ 7·53	58·69	29·04	0 22 28·09 North.
				Mean	0 21 59·05		

Star's No. in Ast. Soc. Cat., Name, and Position with regard to the Zenith.	Face of Sector East.					
	Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.
A. S. C. 869, ε Canis Majoris, North.	Mar. 30	3° 56′ 61″·91	6″·87	3″·79	+ 7″·53	3° 57′ 6″·36
	April 1	64·77	10·15	3·79	7·53	5·94
	5	56·76	1·19	3·82	7·48	6·87
	7	55·48	0·01	3·71	7·44	6·62
	9	57·75	0·01	3·75	7·38	8·87
	10	56·07	0·02	3·69	7·35	7·09
	16	56·37	0·28	3·71	7·03	6·83
	19	56·57	0·06	3·82	6·83	7·16
	21	61·31	0·03	3·73	+ 6·68	(11·69)
					Mean	3 57 6·97
A. S. C. 903, π Argûs, South.	Mar. 30	4 6 22·16	7·84	3·98	+ 9·51	4 6 8·79
	April 1	24·83	11·59	3·98	9·56	7·66
	7	12·27	0·01	3·87	9·61	6·52
	9	11·83	0·01	3·94	9·59	6·17
	10	11·24	0·02	3·85	9·58	5·49
	16	12·08	0·32	3·92	9·39	6·29
	19	12·47	0·07	3·99	9·23	7·16
	21*	11·38	0·03	3·92	+ 9·10	6·07
					Mean	4 6 6·77
A. S. C. 915, η Canis Majoris, North.	Mar. 30	3 42 56·28	6·48	3·59	+ 8·11	3 43 1·50
	April 1	59·94	9·56	3·59	8·16	2·13
	5	56·73	6·64	3·59	8·20	1·88
	10*	50·65	0·02	3·47	8·17	2·37
	16	49·86	0·26	3·53	8·00	1·13
	19	48·98	0·06	3·59	7·86	0·37
	21	48·87	0·02	3·53	+ 7·76	0·14
					Mean	3 43 1·36

Face of Sector West.						Resulting Error of Collimation.	Resulting Mean Zenith Distance, 1838, Jan. 0, completely corrected; and Position with regard to the Zenith.
Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.		
	° ′ ″	″	″	″	° ′ ″	″	° ′ ″
Mar. 31	3 55 66·04	10·69	3·72	+ 7·53	3 56 6·60		
April 4	54·28	0·00	3·78	7·50	5·56		
6	56·16	0·01	3·79	7·47	7·41		
11	56·45	0·05	3·83	7·30	7·53		
15	54·67	0·35	3·86	7·10	5·28		
20	56·26	0·05	3·76	+ 6·76	6·73	30·23	3 56 36·75 North.
				Mean	3 56 6·52		
Mar. 31	4 7 25·14	12·21	3·93	+ 9·54	4 7 7·32		
April 4	13·92	0·00	4·05	9·61	8·36		
6	11·79	0·01	3·95	9·62	6·11		
11	11·40	0·05	3·99	9·55	5·79		
15	11·30	0·40	4·02	9·42	5·50	30·01	4 6 36·78 South.
20	12·98	0·05	3·92	+ 9·17	7·68		
				Mean	4 7 6·79		
Mar. 31	3 41 58·25	10·08	3·55	+ 8·13	3 41 59·85		
April 4	44·70	0·00	3·65	8·19	56·54		
6*	50·14	0·01	3·56	8·20	61·98		
11	48·76	0·05	3·60	8·15	60·46	30·87	3 42 30·49 North.
15	49·65	0·33	3·62	8·04	60·98		
20	46·58	0·04	3·54	+ 7·82	57·90		
				Mean	3 41 59·62		

Star's No. in Ast. Soc. Cat., Name, and Position with regard to the Zenith.	Face of Sector East.					
	Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.
A. S. C. 957,	Mar. 30	° ′ ″ 4 52 30·68	″ 9·40	″ 4·73	″ +10·16	° ′ ″ 4 52 15·85
c Argûs in puppi,	April 5	18·52	0·10	4·73	10·46	12·69
South.	9	18·42	0·01	4·69	10·57	12·53
	16	21·48	0·38	4·66	10·57	15·19
	19	20·29	0·09	4·73	10·50	14·43
	21	17·92	0·04	4·66	+10·44	12·10
					Mean	4 52 13·80
A. S. C. 1015,	April 5*	3 27 12·62	0·07	3·35	+10·95	3 27 (4·95)
q Argûs in puppi,	7	16·77	0·00	3·33	11·08	9·02
South.	9	14·40	0·01	3·33	11·18	6·54
	10	16·92	0·02	3·32	11·25	8·97
	16	17·07	0·27	3·30	11·42	8·68
	21	15·58	0·02	3·30	+11·47	7·39
					Mean	3 27 8·12
A. S. C. 1061,	Mar. 30	2 1 56·07	3·79	1·97	+10·57	2 1 43·68
β Pixidis Nauticæ,	April 5	51·72	0·04	1·97	11·14	42·51
South.	7	51·43	0·00	1·96	11·31	42·08
	9	48·36	0·00	1·96	11·45	38·87
	10	51·52	0·01	1·95	11·52	41·94
	16*	49·74	0·15	1·94	11·81	(39·72)
	19	53·01	0·03	2·00	11·90	43·08
	21	51·72	0·01	1·94	+11·93	41·72
					Mean	2 1 41·98
A. S. C. 1070,	Mar. 30	0 5 58·43	0·17	0·09	+10·27	0 6 8·62
α Pixidis Nauticæ,	April 5	59·22	0·00	0·09	10·83	10·14
North.	9	57·79	0·00	0·09	11·13	9·01
	10	59·57	0·00	0·09	11·20	10·86
	16	57·94	0·01	0·09	11·48	9·51
	19	56·45	0·00	0·09	+11·58	8·12
					Mean	0 6 9·38

Face of Sector West.							
Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.	Resulting Error of Collimation.	Resulting Mean Zenith Distance, 1838, Jan. 0, completely corrected; and Position with regard to the Zenith.
	° ′ ″	″	″	″	° ′ ″	″	° ′ ″
Mar. 31	4 53 33·51	14·63	4·67	+10·24	4 53 13·31		
April 4	19·47	0·00	4·81	10·42	13·86		
6	18·43	0·01	4·69	10·48	12·63		
11	17·19	0·07	4·74	10·58	11·28	29·69	4 52 43·49 South.
15	21·10	0·47	4·78	+10·58	14·83		
				Mean	4 53 13·18		
Mar. 31	3 28 27·06	10·20	3·34	+10·57	3 28 9·63		
April 4	17·77	0·00	3·41	10·88	10·30		
6	15·84	0·01	3·39	11·02	8·20		
11	17·92	0·05	3·36	11·29	9·94	30·72	3 27 38·84 South.
20	17·82	0·04	3·36	+11·47	9·67		
				Mean	3 28 9·55		
April 4	2 2 52·63	0·00	2·01	+11·06	2 2 43·58		
6	52·33	0·00	2·00	11·22	43·11		
11	54·31	0·03	1·98	11·57	44·69	30·99	2 2 12·97 South.
15	54·41	0·19	2·02	+11·77	44·47		
				Mean	2 2 43·96		
Mar. 31	0 4 58·32	0·26	0·09	+10·37	0 5 8·52		
April 6	57·58	0·00	0·09	10·92	8·59		
11	55·21	0·00	0·09	11·25	6·55	30·87	0 5 38·52 North.
15	54·46	0·01	0·09	11·44	5·98		
20*	56·84	0·00	0·09	+11·60	8·63		
				Mean	0 5 7·65		

Star's No. in Ast. Soc. Cat., Name, and Position with regard to the Zenith.	Face of Sector East.					
	Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.
A. S. C. 1115,	Mar. 30	2° 59′ 57″·03	5″·26	2″·89	+10″·19	3° 0′ 4″·85
ε Pixidis Nauticæ,	April 5	52·63	0·19	2·90	10·83	6·17
North.	9	50·51	0·01	2·88	11·19	4·57
	10	50·95	0·02	2·87	11·26	5·06
	16	51·50	0·21	2·85	11·64	5·78
	19	49·47	0·05	2·93	11·79	4·14
	21	49·92	0·02	2·85	+11·86	4·61
					Mean	3 0 5·03
Brisbane (2566),	Mar. 30	1 15 7·91	2·23	1·21	+10·83	1 15 17·72
North.	April 5	6·87	0·04	1·23	11·63	19·69
	7	4·10	0·00	1·19	11·86	17·15
	9	4·55	0·00	1·20	12·07	17·82
	10	4·10	0·01	1·20	12·19	17·48
	16	4·05	0·09	1·21	12·72	17·89
	21	3·36	0·01	1·21	+13·07	17·63
					Mean	1 15 17·91
Brisbane (2823),	Mar. 30	2 35 63·47	4·58	2·52	+11·00	2 36 12·41
North.	April 5	56·65	0·07	2·57	11·87	11·02
	7	56·06	0·00	2·40	12·13	10·59
	10	56·36	0·01	2·50	12·50	11·35
	16	56·70	0·19	2·51	13·14	12·16
	19	52·80	0·04	2·54	13·40	8·70
	21	54·38	0·02	2·52	+13·56	10·44
					Mean	2 36 10·95

Face of Sector West.						Resulting Error of Collimation.	Resulting Mean Zenith Distance, 1838, Jan. 0, completely corrected; and Position with regard to the Zenith.
Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.		
	° ′ ″	″	″	″	° ′ ″	″	° ′ ″
Mar. 31	2 58 59·10	8·19	2·89	+10·31	2 59 4·11		
April 4	48·32	0·00	2·95	10·73	2·00		
6	49·61	0·01	2·93	10·92	3·45		
11	46·64	0·04	2·90	11·33	0·83	31·44	2 59 33·60 North.
15	46·84	0·27	2·96	11·47	1·00		
20	46·84	0·04	2·91	+11·88	1·59		
				Mean	2 59 2·16		
Mar. 31	1 14 9·68	3·47	1·20	+10·98	1 14 18·39		
April 4	4·34	0·00	1·23	11·50	17·07		
6	6·31	0·00	1·22	11·74	19·27		
11	4·44	0·02	1·21	12·28	17·91		
15	3·45	0·11	1·23	12·65	17·22	30·13	1 14 47·78 North.
18	1·27	0·08	1·24	12·88	15·31		
20	4·14	0·02	1·21	+13·02	18·35		
				Mean	1 14 17·65		
Mar. 31	2 34 63·76	7·13	2·50	+11·15	2 35 10·28		
April 4	55·16	0·00	2·55	11·73	9·44		
6	57·13	0·00	2·54	12·01	11·68		
11	55·65	0·03	2·52	12·61	10·75		
15	54·12	0·23	2·56	13·03	9·48	30·44	2 35 40·51 North.
18	54·07	0·16	2·58	13·31	9·80		
20	53·08	0·03	2·52	+13·48	9·05		
				Mean	2 35 10 07		

Star's No. in Ast. Soc. Cat., Name, and Position with regard to the Zenith.	Face of Sector East.					
	Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.
A. S. C. 1243,	April 5	2° 27′ 32″·06	0″·10	2″·43	+12″·17	2° 27′ 46″·56
α Antliæ Pneumaticæ,	7	33·94	0·00	2·35	12·46	48·75
North.	10	33·39	0·01	2·36	12·87	48·61
	16	33·35	0·18	2·38	13·59	49·14
	19	30·18	0·04	2·40	13·90	46·44
	21	30·77	0·02	2·38	+14·09	47·22
					Mean	2 27 47·79
A. S. C. 1299,	Mar. 30	3 33 50·99	6·77	3·47	+11·81	3 33 35·88
South.	April 5	45·01	0·16	3·54	13·01	35·38
	10	45·55	0·02	3·44	13·91	35·06
	16	45·95	0·28	3·47	14·89	34·25
	21	46·05	0·03	3·48	+15·60	33·90
					Mean	3 33 34·89
Brisbane (3350),	Mar. 30	1 36 60·77	2·87	1·56	+11·57	1 37 11·03
North.	April 5	55·97	0·07	1·59	12·64	10·13
	7	56·96	0·00	1·54	12·97	11·47
	10	54·79	0·01	1·55	13·46	9·79
	16	55·18	0·12	1·56	14·30	10·92
	21	53·45	0·01	1·56	+14·93	9·93
					Mean	1 37 10·55
A. S. C. 1356,	Mar. 30	1 44 36·67	3·09	1·69	+11·70	1 44 46·97
19 Crateris,	April 5	33·21	0·07	1·72	12·82	47·68
North.	7	33·06	0·00	1·68	13·17	47·91
	10	31·72	0·01	1·67	13·68	47·06
	16	30·93	0·13	1·68	14·61	47·09
	19	31·03	0·03	1·70	15·03	47·73
	21	31·33	0·01	1·69	+15·30	48·31
					Mean	1 44 47·54

Face of Sector West.							
Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observations.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.	Resulting Error of Collimation.	Resulting Mean Zenith Distance, 1838, Jan. 0, completely corrected; and Position with regard to the Zenith.
Mar. 31	2° 26′ 41″·74	6″·75	2″·36	+11″·38	2° 26′ 48″·73	″	° ′ ″
April 4	33·18	0·00	2·41	12·02	47·61		
6	35·36	0·00	2·40	12·32	50·08		
11	32·79	0·03	2·38	13·00	48·14		
15	32·74	0·22	2·42	13·47	48·41	29·64	2 27 18·15
18	32·34	0·15	2·44	13·80	48·43		North.
20	31·85	0·03	2·38	+14·00	48·20		
				Mean	2 26 48·51		
Mar. 31	3 34 55·16	10·54	3·46	+12·01	3 34 36·07		
April 4	45·12	0·00	3·52	12·81	35·83		
6	43·59	0·01	3·50	13·19	33·89		
15	46·36	0·34	3·53	14·73	34·82	30·25	3 34 5·14
18	47·20	0·23	3·56	15·18	35·35		South.
20	48·43	0·05	3·47	+15·47	36·38		
				Mean	3 34 35·39		
Mar. 31	1 35 61·40	4·47	1·56	+11·76	1 36 10·25		
April 4	55·46	0·00	1·58	12·47	9·51		
6	57·49	0·00	1·57	12·81	11·87		
15	54·97	0·14	1·59	14·17	10·59		
20	53·19	0·02	1·56	+14·81	9·54	30·10	1 36 40·45
							North.
				Mean	1 36 10·35		
Mar. 31	1 43 38·16	4·82	1·68	+11·89	1 43 46·91		
April 4	31·91	0·00	1·71	12·64	46·26		
6	34·48	0·00	1·70	13·00	49·18		
11	32·30	0·02	1·68	13·84	47·80		
15	31·81	0·16	1·72	14·46	47·83	30·11	1 44 17·44
18	30·52	0·11	1·73	14·90	47·04		North.
20	29·44	0·02	1·71	+15·17	46·30		
				Mean	1 43 47·33		

Star's No. in Ast. Soc. Cat., Name, and Position with regard to the Zenith.	Face of Sector East.					
	Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.
A. S. C. 1378,	Mar. 30	0° 18′ 7″·29	0″·57	0″·30	+11″·73	0° 17′ 55″·29
28 Crateris,	April 7	8·67	0·00	0·30	13·33	55·64
South.	10	8·28	0·00	0·30	13·89	54·69
	16	9·76	0·02	0·30	14·92	55·12
	19	10·26	0·01	0·30	15·40	55·15
	21	9·66	0·00	0·30	+15·70	54·26
					Mean	0 17 55·03
A. S. C. 1433,	Mar. 30	5 26 24·73	10·57	5·33	+11·35	5 26 8·14
u Centauri,	April 5	13·76	0·24	5·41	12·80	6·13
South.	7	15·19	0·01	5·27	13·21	7·24
	10	14·65	0·03	5·29	13·87	6·04
	21	16·13	0·04	5·31	+16·07	5·33
					Mean	5 26 6·58
A. S. C. 1527,	Mar. 30	3 8 66·02	5·95	3·08	+10·96	3 8 52·19
ι Centauri,	April 5	58·60	0·14	3·13	12·27	49·32
South.	7	59·89	0·00	3·05	12·70	50·24
	10	59·79	0·02	3·06	13·32	49·51
	16	60·98	0·24	3·08	14·51	49·31
	21	60·73	0·02	3·07	+15·45	48·33
					Mean	3 8 49·82
A. S. C. 1562,	Mar. 30	0 28 61·77	0·86	0·46	+11·13	0 29 12·50
i Centauri,	April 5	59·30	0·02	0·46	12·29	12·03
North.	7	59·30	0·00	0·46	12·67	12·43
	10	59·34	0·00	0·46	13·22	13·02
	16	57·37	0·03	0·46	14·28	12·08
	21	58·60	0·00	0·46	+15·11	14·17
					Mean	0 29 12·71

Face of Sector West.						Resulting Error of Collimation.	Resulting Mean Zenith Distance. 1838, Jan. 0, completely corrected; and Position with regard to the Zenith.
Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.		
	° ′ ″	″	″	″	° ′ ″	″	° ′ ″
Mar. 31	0 19 6·31	0·88	0·30	+11·94	0 18 53·79		
April 4	7·11	0·00	0·31	12·75	54·67		
6	5·52	0·00	0·30	13·14	52·68		
11	8·64	0·00	0·30	14·07	54·87		
15	9·18	0·03	0·31	14·75	54·71		
18	9·23	0·02	0·31	15·24	54·28	29·59	0 18 24·62 South.
20	9·63	0·00	0·31	+15·55	54·39		
				Mean	0 18 54·20		
April 4	5 27 10·95	0·00	5·44	+12·53	5 27 3·86		
6	10·46	0·01	5·34	12·98	2·81		
11	12·98	0·07	5·30	14·07	4·14		
15	13·72	0·53	5·40	14·90	3·69		
18	13·87	0·36	5·43	15·50	3·44	28·57	5 26 35·15 South.
20	14·86	0·07	5·37	+15·87	4·29		
				Mean	5 27 3·71		
Mar. 31*	3 9 69·39	9·27	3·06	+11·18	3 9 51·76		
April 4	59·60	0·00	3·15	12·06	50·69		
6	59·01	0·01	3·09	12·49	49·60		
11	60·00	0·04	3·07	13·52	49·51		
18	61·98	0·21	3·15	14·60	50·32	30·25	3 9 20·07 South.
20	62·18	0·04	3·11	+15·27	49·98		
				Mean	3 9 50·31		
Mar. 31	0 27 62·31	1·34	0·46	+11·33	0 28 12·76		
April 4	60·07	0·00	0·47	12·10	12·64		
6	63·48	0·00	0·47	12·51	16·46		
11	60·96	0·01	0·46	13·40	14·81		
15	59·48	0·04	0·47	13·23	13·14		
18*	57·50	0·03	0·48	14·62	12·57	29·51	0 28 43·21 North.
20	58·10	0·01	0·47	+14·95	13·51		
				Mean	0 28 13·70		

Star's No. in Ast. Soc. Cat., Name, and Position with regard to the Zenith.	Face of Sector East.					
	Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.
A. S. C. 1579,	Mar. 30*	0° 30′ (60″·51)	0″·92	0″·50	+11″·07	0° 31′ (11″·16)
k Centauri,	April 5	61·50	0·00	0·50	12·23	14·23
North.	7	61·35	0·00	0·49	12·60	14·44
	9	61·45	0·00	0·49	12·96	14·90
	10	61·15	0·00	0·49	13·14	14·78
	16	60·21	0·04	0·50	14·19	14·86
	19	59·17	0·01	0·50	14·69	14·35
	21	60·76	0·00	0·49	+15·03	16·28
					Mean	0 31 14·83
A. S. C. 1604,	Mar. 30	2 51 52·66	5·40	2·80	+10·35	2 51 39·71
θ Centauri,	April 5	47·37	0·01	2·85	11·58	38·63
South.	7	49·15	0·00	2·79	11·97	39·97
	9	48·90	0·01	2·76	12·37	39·28
	10	49·94	0·02	2·78	12·56	40·14
	16	50·24	0·22	2·80	13·70	39·12
	19	51·13	0·05	2·84	+14·26	39·66
					Mean	2 51 39·50
A. S. C. 1661,	Mar. 30	1 45 60·11	3·29	1·73	+ 9·94	1 45 48·61
c^1 Centauri,	April 5	54·92	0·00	1·76	11·04	45·64
South.	7	56·31	0·00	1·72	11·50	46·53
	10	55·37	0·01	1·72	11·92	45·16
	16	57·79	0·13	1·73	12·95	46·44
	19	56·95	0·03	1·75	13·46	45·21
	21	56·75	0·01	1·73	+13·78	44·69
					Mean	1 45 46·04

Face of Sector West.						Resulting Error of Collimation.	Resulting Mean Zenith Distance, 1838, Jan. 0, completely corrected; and Position with regard to the Zenith.
Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.		
	° ′ ″	″	″	″	° ′ ″	″	° ′ ″
Mar. 31	0 30 2·93	1·43	0·49	+11·27	0 30 13·26		
April 4	2·27	0·00	0·51	12·04	14·82		
6	4·94	0·00	0·50	12·41	17·85		
11	1·48	0·01	0·49	13·32	15·28		
15	2·22	0·05	0·50	14·02	16·69	29·53	0 30 45·30 North.
18	1·68	0·03	0·51	14·53	16·69		
20	0·45	0·01	0·50	+14·86	15·80		
				Mean	0 30 15·77		
Mar. 31	2 52 55·59	8·40	2·78	+10·55	2 52 39·42		
April 4	49·81	0·00	2·86	11·37	41·30		
6	46·54	0·01	2·84	11·78	37·59		
11	47·78	0·04	2·79	12·76	37·77		
15	50·05	0·27	2·84	13·52	39·10	29·80	2 52 9·30 South.
18	50·85	0·19	2·89	14·07	39·48		
20	50·65	0·04	2·83	+14·44	39·00		
				Mean	2 52 39·09		
Mar. 31	1 46 59·68	5·12	1·73	+10·13	1 46 46·16		
April 4	57·16	0·00	1·77	10·86	48·07		
6	53·59	0·00	1·75	11·21	44·13		
11	55·38	0·02	1·72	12·10	44·98		
15	57·85	0·17	1·76	12·80	46·64	29·94	1 46 15·98 South.
18	57·80	0·11	1·78	13·29	46·18		
20	57·16	0·02	1·76	+13·62	45·28		
				Mean	1 46 45·92		

Star's No. in Ast. Soc. Cat., Name, and Position with regard to the Zenith.	Face of Sector East.					
	Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.
A. S. C. 1742,	Mar. 30*	3° (32′ 10″·24)	6″·77	3″·49	+ 8″·79	° ′ ″
φ^2 Lupi,	April 5	33 52·23	0·01	3·57	9·79	3 33 46·00
South.	7	53·26	0·00	3·47	10·12	46·61
	10	54·15	0·02	3·48	10·61	47·00
	16	54·65	0·28	3·52	11·58	46·31
	19	55·34	0·06	3·53	12·05	46·76
	21	54·65	0·03	3·49	+12·37	45·74
					Mean	3 33 46·40
A. S. C. 1774,	Mar. 30	3 27 62·89	6·05	3·38	+10·26	3 28 10·48
40 Libræ,	April 5	57·11	0·01	3·45	11·02	11·57
North.	7	55·18	0·00	3·36	11·26	9·80
	10	55·13	0·02	3·37	11·62	10·10
	16	55·13	0·25	3·40	12·32	10·60
	19	53·99	0·05	3·45	12·67	10·06
	21	55·87	0·02	3·38	+12·89	12·12
					Mean	3 28 10·68
A. S. C. 1797,	Mar. 30	0 25 17·50	0·78	0·42	+ 9·03	0 25 8·11
λ Lupi,	April 5	16·26	0·00	0·43	9·83	6·86
South.	7	17·25	0·00	0·42	10·09	7·58
	10	17·25	0·00	0·42	10·49	7·18
	19*	18·19	0·01	0·43	11·64	6·77
	21	18·49	0·00	0·42	+11·89	7·02
					Mean	0 25 7·25

Face of Sector West.						Resulting Error of Collimation.	Resulting Mean Zenith Distance, 1838, Jan. 0, completely corrected; and Position with regard to the Zenith.
Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.		
	° ′ ″	″	″	″	° ′ ″	″	° ′ ″
Mar. 31	3 34 63·81	10·54	3·48	+ 8·96	3 34 47·79		
April 4	54·17	0·00	3·56	9·63	48·10		
6	50·95	0·01	3·53	9·96	44·51		
15	54·96	0·34	3·54	11·42	46·74	30·23	3 34 16·63
18	55·75	0·23	3·59	11·90	47·21		South.
20	55·45	0·05	3·54	+12·21	46·73		
				Mean	3 34 46·85		
Mar. 31	3 26 66·04	9·42	3·37	+10·39	3 27 10·38		
April 4	54·37	0·00	3·44	10·57	8·38		
6	58·43	0·01	3·42	11·14	12·98		
15	54·82	0·31	3·43	12·21	10·15	30·26	3 27 40·42
18	54·03	0·21	3·48	12·56	9·86		North.
20	53·04	0·04	3·44	+12·78	9·22		
				Mean	3 27 10·16		
Mar. 31	0 26 15·93	1·22	0·42	+ 9·17	0 26 5·96		
April 4	17·02	0·00	0·43	9·70	7·75		
6	13·76	0·00	0·42	9·96	4·22		
15	17·81	0·04	0·43	11·13	7·07	29·56	0 25 36·81
18	17·91	0·03	0·43	+11·51	6·80		South.
				Mean	0 26 6·36		

Star's No. in Ast. Soc. Cat., Name, and Position with regard to the Zenith.	Face of Sector East.					
	Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.
A. S. C. 1821,	Mar. 30	° ′ ″ 5 13 18·13	″ 10·13	″ 5·12	″ + 7·54	° ′ ″ 5 13 5·58
η Lupi,	April 5	9·17	0·01	5·23	8·41	5·98
South.	7	9·17	0·01	5·09	8·60	5·65
	10	10·65	0·03	5·10	9·14	6·58
	16	10·75	0·41	5·15	10·01	5·48
	19	11·15	0·09	5·22	10·44	5·84
	21	10·26	0·04	5·12	+10·73	4·61
					Mean	5 13 5·67
A. S. C. 1835,	Mar. 30	3 38 57·42	6·94	3·57	+ 7·87	3 38 46·18
θ Lupi,	April 5	49·80	0·01	3·65	8·67	44·77
South.	7	50·40	0·01	3·55	8·94	45·00
	10	50·94	0·02	3·56	9·33	45·15
	16	51·39	0·28	3·60	10·13	44·58
	19	51·19	0·06	3·65	10·53	44·25
	21	50·99	0·03	3·58	+10·79	43·75
					Mean	3 38 44·81
A. S. C. 1866,	Mar. 30	2 11 58·05	3·89	2·14	+ 9·27	2 12 5·57
p Scorpii,	April 5	54·34	0·00	2·19	9·87	6·40
North.	10	52·96	0·01	2·13	10·37	5·45
	16	52·91	0·16	2·15	10·95	5·85
	19	51·72	0·04	2·18	11·24	5·10
	21	52·51	0·01	2·14	+11·42	6·06
					Mean	2 12 5·74

Face of Sector West.						Resulting Error of Collimation.	Resulting Mean Zenith Distance, 1838, Jan. 0, completely corrected; and Position with regard to the Zenith.
Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.		
	° ′ ″	″	″	″	° ′ ″	″	° ′ ″
Mar. 31	5 14 21·84	15·76	5·10	+ 7·69	5 14 3·49		
April 4	7·30	0·00	5·22	8·27	4·25		
6	4·98	0·01	5·19	8·56	1·60		
15	9·38	0·51	5·19	9·86	4·20		
18	9·58	0·35	5·28	10·30	4·21	28·95	5 13 34·62 South.
20	9·03	0·07	5·22	+10·58	3·60		
				Mean	5 14 3·56		
Mar. 31	3 39 60·10	10·80	3·56	+ 8·00	3 39 44·86		
April 4	49·77	0·00	3·64	8·54	44·87		
6	47·84	0·01	3·62	8·80	42·65		
15	50·61	0·35	3·63	10·00	43·89		
18	51·70	0·24	3·69	10·39	44·76	29·75	3 39 14·56 South.
20	51·89	0·05	3·64	+10·66	44·82		
				Mean	3 39 44·31		
Mar. 31	2 10 59·91	6·05	2·13	+ 9·37	2 11 5·36		
April 4	52·65	0·00	2·18	9·78	4·61		
15	52·40	0·20	2·17	10·85	5·22		
18	52·20	0·13	2·20	11·14	5·41	30·17	2 11 35·58 North.
20	52·99	0·03	2·18	+11·33	6·47		
				Mean	2 11 5·41		

Star's No. in Ast. Soc. Cat., Name, and Position with regard to the Zenith.	Face of Sector East.					
	Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.
A. S. C. 1889,	Mar. 30	1° 38′ 18″·66	3″·05	1″·61	+ 7″·85	1° 38′ 9″·37
α Normæ,	April 5	14·56	0·00	1·64	8·48	7·72
South.	7	15·25	0·00	1·60	8·70	8·15
	10	15·40	0·01	1·60	9·01	7·98
	16	16·53	0·12	1·62	9·64	8·39
	19	16·78	0·03	1·64	9·95	8·44
	21	15·69	0·01	1·61	+10·16	7·13
					Mean	1 38 8·17
A. S. C. 1915,	Mar. 30	1 17 11·20	2·39	1·26	+ 7·55	1 16 62·52
ε Scorpii,	April 5	5·69	0·00	1·29	8·07	58·91
South.	10	6·98	0·01	1·26	8·51	59·72
	16	7·57	0·10	1·27	9·04	59·70
	21	6·39	0·01	1·27	+ 9·48	58·17
					Mean	1 16 59·80
A. S. C. 1947,	Mar. 30	1 10 54·38	2·19	1·16	+ 7·26	1 10 46·09
k Scorpii,	April 5	51·02	0·00	1·19	7·70	44·51
South.	10	52·40	0·01	1·16	8·07	45·48
	16	51·91	0·11	1·17	8·52	44·45
	19	52·15	0·02	1·19	8·75	44·57
	21	50·03	0·01	1·16	+ 8·90	42·28
					Mean	1 10 44·56
A. S. C. 1969,	April 5	0 14 3·94	0·41	0·22	+ 7·79	0 14 11·54
u Scorpii,	10	0·68	0·00	0·22	8·09	8·99
North.	16	1·97	0·02	0·22	8·44	10·61
	19	1·17	0·00	0·22	8·62	10·01
	21	3·20	0·00	0·22	+ 8·74	12·16
					Mean	0 14 10·66

Face of Sector West.						Resulting Error of Collimation.	Resulting Mean Zenith Distance, 1838, Jan. 0, completely corrected; and Position with regard to the Zenith.
Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.	″	° ′ ″
Mar. 31	1° 39′ 19″·66	4″·74	1″·60	+ 7″·96	1° 39′ 8″·56		
April 4	18·28	0·00	1·64	8·38	11·54		
6	13·93	0·00	1·63	8·59	(6·97)		
15	17·09	0·15	1·63	9·53	9·04		
20	16·70	0·02	1·64	+ 10·06	8·26	30·59	1 38 38·76
							South.
				Mean	1 39 9·35		
Mar. 31	1 18 9·66	3·71	1·26	+ 7·63	1 17 59·58		
April 4	8·48	0·00	1·29	7·98	61·79		
6	4·32	0·00	1·28	8·16	(57·44)		
18	8·97	0·08	1·30	9·22	60·97	30·40	1 17 30·20
20	8·18	0·02	1·29	+ 9·44	60·01		South.
				Mean	1 18 0·59		
Mar. 31	1 11 53·90	3·41	1·16	+ 7·33	1 11 44·32		
April 4	52·17	0·00	1·18	7·62	45·73		
6	48·01	0·00	1·18	7·77	(41·42)		
15	52·02	0·11	1·18	8·44	44·65		
18	50·73	0·08	1·20	8·67	43·18	29·88	1 11 14·44
20	51·33	0·01	1·18	+ 8·82	43·68		South.
				Mean	1 11 44·31		
Mar. 31	0 13 3·83	0·63	0·22	+ 7·50	0 13 10·92		
April 4	2·94	0·00	0·22	7·74	10·90		
6	5·96	0·00	0·22	7·85	(14·03)		
15	2·84	0·02	0·22	8·38	11·42		
18	2·25	0·01	0·22	8·54	11·00	29·82	0 13 40·84
20	1·95	0·00	0·22	+ 8·68	10·85		North.
				Mean	0 13 11·02		

Star's No. in Ast. Soc. Cat., Name, and Position with regard to the Zenith.	Face of Sector East.					
	Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.
A. S. C. 2007,	Mar. 30	4° 16′ 22″·65	8″·18	4″·21	+ 5″·60	4° 16′ 13″·08
λ Scorpii,	April 5	10·10	0·01	4·25	5·92	8·42
South.	10	12·08	0·03	4·18	6·19	10·04
	16	10·59	0·33	4·21	6·55	7·92
	19	10·00	0·07	4·29	6·73	7·49
	21	9·51	0·03	4·20	+ 6·86	6·82
					Mean	4 16 8·96
A. S. C. 2043,	Mar. 30	4 16 41·93	8·19	4·22	+ 5·22	4 16 32·74
γ Telescopii,	April 10	32·25	0·03	4·18	5·62	30·78
South.	16	30·37	0·33	4·21	5·88	28·37
	19	30·76	0·07	4·29	6·02	28·96
	21	29·58	0·03	4·20	+ 6·11	27·64
					Mean	4 16 29·70
A. S. C. 2079,	Mar. 30	2 17 17·53	4·04	2·24	+ 7·09	2 17 22·82
γ Sagittarii,	April 10	13·08	0·01	2·23	7·19	22·49
North.	16	15·01	0·16	2·24	7·23	24·32
	19	14·46	0·04	2·28	7·26	23·96
	21	15·40	0·02	2·23	+ 7·28	24·89
					Mean	2 17 23·70
A. S. C. 2101,	Mar. 30	4 5 47·21	7·83	4·04	+ 4·65	4 5 38·77
β Telescopii,	April 10	38·16	0·02	4·01	4·72	37·43
South.	16	37·27	0·32	4·04	4·80	36·19
	19	35·49	0·07	4·11	4·85	34·68
	21	35·59	0·03	4·03	+ 4·89	34·70
					Mean	4 5 36·35

Face of Sector West.						Resulting Error of Collimation.	Resulting Mean Zenith Distance, 1838, Jan. 0, completely corrected; and Position with regard to the Zenith.
Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.		
	° ′ ″	″	″	″	° ′ ″	″	° ′ ″
Mar. 31	4 17 22·96	12·74	4·17	+ 5·65	4 17 8·74		
April 4	8·92	0·00	4·26	5·86	7·32		
6	7·05	0·01	4·24	5·97	(5·31)	29·24	4 16 38·20
15	9·82	0·41	4·25	6·49	7·17		South.
18	9·57	0·28	4·31	6·67	6·93		
20	9·57	0·06	4·27	+ 6·80	6·98		
				Mean	4 17 7·43		
Mar. 31	4 17 44·27	12·75	4·17	+ 5·25	4 17 30·44		
April 4	29·14	0·00	4·27	5·39	28·02		
6	26·72	0·01	4·26	5·47	(25·50)		
15	30·58	0·41	4·25	5·84	28·58	29·39	4 16 59·08
18	29·19	0·28	4·32	5·97	27·26		South.
20	29·88	0·06	4·27	+ 6·06	28·03		
				Mean	4 17 28·47		
Mar. 31	2 16 23·64	2·69	2·22	+ 7·10	2 16 (30·27)		
April 4	16·03	0·00	2·27	7·13	25·43		
6	18·80	0·00	2·27	7·15	(28·22)		
15	17·32	0·20	2·26	7·22	26·60	28·93	2 16 54·78
18	15·73	0·14	2·30	7·26	25·15		North.
20	16·72	0·03	2·27	+ 7·28	26·24		
				Mean	2 16 25·85		
Mar. 31	4 6 49·15	12·19	4·00	+ 4·65	4 6 36·31		
April 4	38·28	0·00	4·09	4·67	37·70		
6	34·42	0·01	4·08	4·68	(33·81)		
15	36·99	0·40	4·07	4·78	35·88	30·12	4 6 6·47
18	37·04	0·27	4·14	4·83	36·08		South.
20	37·73	0·05	4·09	+ 4·86	36·91		
				Mean	4 6 36·58		

Star's No. in Ast. Soc. Cat., Name, and Position with regard to the Zenith.	Face of Sector East.					
	Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.
A. S. C. 2110,	Mar. 30	1° 44′ 49″·42	3″·25	1″·73	+ 5″·30	1° 44′ 42″·60
ε Sagittarii,	April 10	45·02	0·01	1·71	5·27	41·45
South.	16	44·38	0·13	1·72	5·27	40·70
	19	43·88	0·03	1·76	5·28	40·33
	21	42·30	0·01	1·72	+ 5·29	38·72
					Mean	1 44 40·76
A. S. C. 2741,	Mar. 30	2 13 46·00	3·94	2·18	+ 2·27	2 13 46·51
α Piscis Australis	April 5	46·24	0·00	2·20	+ 0·92	49·36
(Fomalhaut),	10	45·50	0·01	2·17	− 0·23	47·43
North.	16	46·44	0·16	2·18	− 1·62	46·84
	19	51·53	0·04	2·22	− 2·32	51·39
	21	50·00	0·01	2·12	− 2·79	49·32
					Mean	2 13 48·48

Face of Sector West.						Resulting Error of Collimation.	Resulting Mean Zenith Distance, 1838, Jan. 0, completely corrected; and Position with regard to the Zenith.
Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.		
	° ′ ″	″	″	″	° ′ ″	″	° ′ ″
Mar. 31	1 45 48·84	5·07	1·71	+ 5·30	1 45 40·18		
April 4	45·18	0·00	1·75	5·28	41·65		
6	41·23	0·00	1·74	5·27	(37·70)		
15	44·59	0·16	1·74	5·27	40·90	30·04	1 45 10·80
18	44·84	0·11	1·77	5·28	41·22		South.
20	43·80	0·02	1·75	+ 5·29	40·24		
				Mean	1 45 40·84		
Mar. 31	2 12 54·29	6·13	2·05	+ 2·05	2 12 52·26		
April 4	47·62	0·00	2·21	+ ~~2~~·15	5~~1~~0·98		
15	50·09	0·20	2·20	− 1·39	50·70	4	
18	45·84	0·14	2·17	− 2·09	45·78	29·~~2~~7	2 13 19·22
20	49·39	0·03	2·21	− 2·55	49·02		North.
				Mean	2 12 49·95		
					− 0″20		

§ 13. Collection of all the Results of Observation of each Star

Star's No. in Ast. Soc. Cat., Name, and Position with regard to the Zenith.	Face of Sector East.					
	Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.
A. S. C. 699, α Columbæ, South.	May 16	0° 14′ 12″·45	0″·00	0″·24	− 0″·79	0° 14′ 13″·48
	27	9·97	0·00	0·24	3·60	13·81
	June 3	6·51	0·00	0·24	5·51	12·26
	4	6·42	0·00	0·24	5·80	12·46
	8	6·12	0·00	0·24	6·93	13·29
	20	2·86	0·00	0·24	10·43	13·53
	23	0·98	0·00	0·25	11·32	12·55
	25	1·87	0·00	0·25	−11·91	14·03
					Mean	0 14 13·18
A. S. C. 732, β Columbæ, South.	May 27	1 54 15·71	0·02	1·92	− 2·68	1 54 20·29
	June 3	12·99	0·02	1·91	4·59	19·47
	4	11·90	0·02	1·91	4·87	18·66
	8	11·46	0·02	1·93	6·00	19·37
	23	8·44	0·01	1·94	10·40	20·77
	25	6·81	0·03	1·93	−11·00	19·71
					Mean	1 54 19·71

AT CAPE TOWN, AND DEDUCTION OF MEAN ZENITH DISTANCE, 1838, JANUARY 0.

Face of Sector West.						Resulting Error of Collimation.	Resulting Mean Zenith Distance, 1838, Jan. 0, completely corrected; and Position with regard to the Zenith.
Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.		
	° ′ ″	″	″	″	° ′ ″	″	° ′ ″
May 28	0 14 57·13	0·00	0·24	− 3·86	0 14 61·23		
29	55·35	0·00	0·24	4·14	59·73		
June 7	57·03	0·01	0·24	6·64	63·90		
17	51·35	0·00	0·24	9·54	61·13		
19	50·01	0·00	0·24	10·13	60·38	23·95	0 14 37·13
24	48·63	0·00	0·25	11·61	60·49		South.
26	48·24	0·00	0·24	−12·20	60·68		
				Mean	0 15 1·08		
May 28	1 54 64·35	0·06	1·91	− 2·95	1 55 9·15		
29	62·72	0·05	1·89	3·23	7·79		
June 7	63·71	0·11	1·93	5·71	11·24		
17	57·92	0·01	1·93	8·62	8·46		
19	57·23	0·00	1·92	9·21	8·36	24·42	1 54 44·13
22	56·10	0·03	1·95	10·11	8·13		South.
24	55·35	0·03	1·95	10·70	7·97		
26	54·12	0·02	1·93	−11·30	7·33		
				Mean	1 55 8·55		

Star's No. in Ast. Soc. Cat., Name, and Position with regard to the Zenith.	Face of Sector East.					
	Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.
A. S. C. 791, ζ Canis Majoris, North.	May 27	3° 55′ 51″·16	0″·04	3″·96	− 1″·06	3° 55′ 54″·02
	June 2	51·01	0·00	3·94	2·47	52·48
	4	52·89	0·04	3·94	2·96	53·83
	23	55·17	0·02	4·00	− 7·91	51·24
					Mean	3 55 52·89
A. S. C. 848, κ Canis Majoris, North.	May 13	1 35 59·91	0·02	1·60	+ 4·09	1 36 5·58
	27	64·46	0·02	1·61	+ 1·36	7·41
	June 8	66·04	0·02	1·61	− 1·40	6·23
	23	69·21	0·01	1·62	− 5·24	5·58
	25	69·80	0·02	1·62	− 5·78	5·62
					Mean	1 36 6·08
A. S. C. 869, ε Canis Majoris, North.	May 13	5 10 5·78	0·08	5·18	+ 4·00	5 10 14·88
	21	8·06	0·27	5·19	+ 2·62	15·60
	27	9·89	0·05	5·21	+ 1·47	16·52
	30	12·85	0·56	5·19	+ 0·86	18·34
	June 2	11·32	0·00	5·19	+ 0·22	16·73
	3	10·88	0·06	5·18	+ 0·01	16·01
	4	11·52	0·06	5·18	− 0·21	16·43
	8	12·06	0·05	5·23	− 1·06	16·18
	18	15·18	0·04	5·23	− 3·46	16·91
	23	13·94	0·03	5·27	− 4·76	14·42
	25	15·32	0·06	5·24	− 5·20	15·30
					Mean	5 10 16·12

Face of Sector West.						Resulting Error of Collimation.	Resulting Mean Zenith Distance, 1838, Jan. 0, completely corrected; and Position with regard to the Zenith.
Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.		
	° ′ ″	″	″	″	° ′ ″	″	° ′ ″
May 26	3 54 59·80	0·19	3·97	− 0·83	3 55 2·75		
29	62·03	0·09	3·88	1·52	4·30		
June 7	62·37	0·20	3·97	3·71	2·43		
19	67·32	0·00	3·96	6·83	4·45	24·42	3 55 28·47
22	68·65	0·06	4·00	7·64	4·95		North.
24	69·15	0·05	4·00	8·18	4·92		
26	69·29	0·04	3·97	− 8·72	4·50		
				Mean	3 55 4·04		
June 22	1 35 21·45	0·03	1·63	− 4·98	1 35 18·07		
24	22·79	0·02	1·62	− 5·51	18·88	23·80	1 35 42·28
							North.
				Mean	1 35 18·48		
May 17	5 9 19·96	0·05	5·19	+ 3·33	5 9 28·43		
26	20·45	0·24	5·22	+ 1·67	27·10		
29	23·96	0·12	5·11	+ 1·06	30·01		
June 19	25·99	0·00	5·21	− 3·71	27·49		
22	26·39	0·08	5·27	− 4·45	27·13		
24	28·41	0·06	5·27	− 4·95	28·67	23·97	5 9 52·15
26	28·71	0·06	5·22	− 5·45	28·42		North.
				Mean	5 9 28·18		

Star's No. in Ast. Soc. Cat., Name, and Position with regard to the Zenith.	Face of Sector East.					
	Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.
A. S. C. 903,	May 21	2° 52′ 63″·14	0″·16	2″·90	+ 6″·62	2° 52′ 59″·26
π Argûs,	27	59·19	0·03	2·91	+ 4·09	57·98
South.	June 2	57·46	0·00	2·90	+ 2·82	57·54
	3	56·81	0·04	2·89	+ 2·60	57·06
	8	56·72	0·03	2·91	+ 1·44	58·16
	23	53·75	0·02	2·94	— 2·35	59·02
	25	52·81	0·04	2·93	— 2·88	58·58
					Mean	2 52 58·23
A. S. C. 915,	May 21	4 55 58·49	0·26	4·95	+ 4·35	4 56 7·53
η Canis Majoris,	27	59·81	0·05	4·97	+ 3·31	8·04
North.	June 3	62·38	0·06	4·94	+ 1·97	9·23
	8	63·32	0·05	4·97	+ 0·94	9·18
	18	65·05	0·04	4·99	— 1·28	8·72
	23	65·80	0·03	5·02	— 1·46	9·33
	25	66·04	0·06	5·00	— 2·94	8·04
					Mean	4 56 8·58
A. S. C. 957,	May 13	3 39 10·27	0·06	3·67	+ 8·58	3 39 5·30
c Argûs in Puppi,	June 2	4·39	0·00	3·67	+ 5·28	2·78
South.	21	2·36	0·03	3·69	+ 1·00	5·02
	23	2·41	0·02	3·72	+ 0·50	5·61
	27	1·37	0·01	3·67	— 0·52	5·55
					Mean	3 39 4·85
A. S. C. 1015,	May 13	2 14 8·89	0·04	2·25	+10·38	2 14 0·72
q Argûs in Puppi,	21	7·75	0·13	2·25	+ 9·49	0·38
South.					Mean	2 14 0·55

Face of Sector West.						Resulting Error of Collimation.	Resulting Mean Zenith Distance, 1838, Jan. 0, completely corrected; and Position with regard to the Zenith.
Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.		
May 17	2° 53′ 48″.37	0″.03	2″.90	+ 5″.97	2° 53′ 45″.27	″	° ′ ″
28	48·52	0·09	2·89	+ 3·89	47·43		
29	45·56	0·07	2·85	+ 3·68	44·66		
June 19	42·24	0·00	2·91	− 1·29	46·44	23·93	2 53 22·16 South.
22	42·49	0·05	2·95	− 2·08	47·47		
24	39·92	0·04	2·94	− 2·61	45·43		
26	39·82	0·03	2·92	− 3·15	45·86		
				Mean	2 53 46·08		
May 17	4 55 11·67	0·05	4·95	+ 4·98	4 55 21·55		
28	9·49	0·14	4·94	+ 3·12	17·41		
29	14·24	0·11	4·87	+ 2·94	21·94		
June 19	17·20	0·00	4·97	− 1·52	20·65		
22	18·69	0·08	5·01	− 2·22	21·40	23·85	4 55 44·74 North.
24	18·78	0·06	5·03	− 2·70	21·05		
26	20·47	0·05	4·98	− 3·18	22·22		
				Mean	4 55 20·89		
May 17	3 39 56·14	0·04	3·67	+ 8·04	3 39 51·73		
28	55·45	0·12	3·66	6·24	52·75		
29	53·87	0·09	3·61	6·05	51·34		
June 19	50·81	0·00	3·69	1·49	53·01	23·57	3 39 28·42 South.
22	48·83	0·06	3·73	0·75	51·75		
24	47·89	0·05	3·73	+ 0·25	51·32		
				Mean	3 39 51·98		
May 28	2 14 53·87	0·07	2·24	+ 8·53	2 14 47·51	23·48	2 14 24·03 South.

Star's No. in Ast. Soc. Cat., Name, and Position with regard to the Zenith.	FACE OF SECTOR EAST.					
	Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.
A. S. C. 1061,	May 13	0° 48′ 45″·85	0″·01	0″·82	+11″·30	0° 48′ 35″·36
β Pixidis Nauticæ,	21	43·97	0·05	0·82	10·59	34·15
South.	27	42·00	0·01	0·82	9·89	32·92
	June 8	41·01	0·01	0·82	8·13	33·69
	25	40·22	0·01	0·83	+ 4·89	36·15
					Mean	0 48 34·45
A. S. C. 1070,	May 13	1 19 1·72	0·00	1·31	+11·01	1 19 14·04
α Pixidis Nauticæ,	June 2	6·42	0·00	1·32	+ 8·86	16·60
North.					Mean	1 19 15·32
A. S. C. 1115,	May 13	4 12 54·20	0·06	4·22	+11·68	4 13 10·04
ε Pixidis Nauticæ,	21	55·98	0·22	4·23	+11·18	11·17
North.					Mean	4 13 10·61
BRISBANE (2566),	May 13	2 28 9·07	0·04	2·47	+13·46	2 28 24·96
North.	21	9·57	0·13	2·47	13·14	25·05
	27	11·84	0·02	2·48	+12·76	27·06
					Mean	2 28 25·69
BRISBANE (2823),	May 13	3 48 58·41	0·06	3·82	+14·38	3 49 16·55
North.	21	60·09	0·20	3·82	14·24	17·95
	27	61·47	0·04	3·84	14·02	19·29
	June 2	61·77	0·00	3·83	+13·62	19·22
					Mean	3 49 18·25

Face of Sector West.							
Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.	Resulting Error of Collimation.	Resulting Mean Zenith Distance, 1838, Jan. 0, completely corrected; and Position with regard to the Zenith.
	° ′ ″	″	″	″	° ′ ″	″	° ′ ″
May 26	0 49 31·73	0·04	0·83	+10·02	0 49 22·50		
28	30·79	0·03	0·82	9·76	21·82		
29	28·86	0·02	0·83	9·62	20·05		
June 17	27·47	0·00	0·82	6·51	21·78		
22	25·99	0·01	0·83	5·51	21·30	23·34	0 48 57·79 South.
24	24·90	0·01	0·83	5·10	20·62		
26	23·62	0·01	0·82	+ 4·68	19·75		
				Mean	0 49 21·12		
May 29*	1 18 19·26	0·01	1·30	+ 9·40	1 18 30·05	22·64	1 18 52·69 North.
May 12	4 12 10·31	0·00	4·22	+11·72	4 12 26·25	22·55	4 12 48·06 North.
17	9·12	0·04	4·23	+11·46	24·77		
				Mean	4 12 25·51		
May 12	2 27 22·61	0·00	2·47	+13·48	2 27 38·56		
17	21·82	0·02	2·47	13·33	37·60		
28	20·88	0·07	2·46	12·68	35·95	24·06	2 28 1·63 North.
29	23·20	0·06	2·43	+12·60	38·17		
				Mean	2 27 37·57		
May 12	3 48 13·03	0·00	3·82	+14·38	3 48 31·23		
17	12·53	0·04	3·82	14·33	30·64		
26	11·89	0·18	3·85	14·04	29·60		
28	11·25	0·11	3·81	13·93	28·88	24·01	3 48 54·24 North.
29	13·23	0·09	3·76	+13·88	30·78		
				Mean	3 48 30·23		

Star's No. in Ast. Soc. Cat., Name, and Position with regard to the Zenith.	Face of Sector East.					
	Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.
A. S. C. 1243,	May 13	3° 40′ 35″·64	0″·06	3″·68	+15″·25	3° 40′ 54″·51
α Antliæ Pneu-	21	36·28	0·19	3·68	15·25	55·02
maticæ,	27	38·26	0·04	3·70	15·11	57·03
North.	June 2	39·15	0·00	3·69	14·84	57·68
	4	39·84	0·04	3·67	14·72	58·19
	8	39·25	0·03	3·70	14·45	57·37
	18	39·35	0·03	3·71	13·56	56·59
	23	38·76	0·02	3·74	13·00	55·48
	25	39·55	0·05	3·72	12·76	55·98
	27	39·50	0·01	3·68	+12·50	55·67
					Mean	3 40 56·35
A. S. C. 1299,	May 13	2 20 43·60	0·04	2·36	+17·64	2 20 28·28
South.	27	40·24	0·02	2·37	18·01	24·58
	June 2	39·79	0·00	2·36	17·93	24·22
	4	40·49	0·03	2·35	17·88	24·93
	8	42·27	0·02	2·37	17·71	26·91
	18	40·34	0·02	2·38	17·09	25·61
	21	41·52	0·02	2·37	16·83	27·04
	23	40·54	0·01	2·39	16·63	26·29
	27	39·35	0·01	2·36	+16·21	25·49
					Mean	2 20 25·93
Brisbane (3350),	May 13	2 49 58·02	0·04	2·83	+16·67	2 50 17·48
North.	27	59·90	0·03	2·85	+16·92	19·64
					Mean	2 50 18·56

Face of Sector West.						Resulting Error of Collimation.	Resulting Mean Zenith Distance, 1838, Jan. 0, completely corrected; and Position with regard to the Zenith.
Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.		
May 12	3° 39′ 50″·61	0″·00	3″·68	+15″·24	3° 40′ 9″·53	″	° ′ ″
17	49·13	0·04	3·68	15·28	8·05		
28	46·95	0·11	3·67	15·07	5·58		
29	49·22	0·09	3·69	15·03	7·85		
June 19	51·25	0·00	3·70	13·45	8·40		
24	52·09	0·05	3·73	12·88	8·65	24·07	3 40 32·29
26	53·18	0·04	3·70	+12·63	9·47		North.
				Mean	3 40 8·22		
May 12	2 21 27·40	0·00	2·36	+17·60	2 21 12·16		
17	29·97	0·02	2·36	17·83	14·48		
28	31·01	0·07	2·35	18·00	15·29		
29	27·94	0·06	2·36	17·99	12·25		
June 7	30·46	0·13	2·38	17·77	14·94	23·93	2 20 49·86
19	28·88	0·00	2·37	17·00	14·25		South.
22	28·58	0·04	2·40	16·72	14·22		
26	26·75	0·03	2·37	+16·32	12·77		
				Mean	2 21 13·80		
May 12	2 49 13·04	0·00	2·83	+16·27	2 49 32·14		
15	12·15	0·02	2·81	16·75	31·69		
28	8·79	0·08	2·83	16·91	28·45	23·95	2 49 54·61
29	10·96	0·07	2·84	16·90	30·63		North.
June 7	11·06	0·15	2·86	+16·65	30·42		
				Mean	2 49 30·67		

Star's No. in Ast. Soc. Cat., Name, and Position with regard to the Zenith.	Face of Sector East.					
	Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.
A. S. C. 1356,	May 13	2° 57′ 34″·87	0″·05	2″·96	+17″·40	2° 57′ 55″·18
19 Crateris,	21	35·02	0·16	2·96	17·78	55·60
North.	30	37·69	0·33	2·96	17·96	58·28
	June 4	37·89	0·03	2·95	17·94	58·75
	6	37·39	0·04	2·99	17·90	58·24
	8	36·11	0·03	2·98	17·87	56·93
	18	36·90	0·02	2·98	17·47	57·33
	21	37·30	0·02	2·98	17·29	57·55
	23	35·47	0·02	3·01	17·16	55·62
	25	36·95	0·04	2·98	17·02	56·91
	27	35·57	0·01	2·96	+16·86	55·38
					Mean	2 57 56·89
A. S. C. 1378,	May 13	0 54 51·79	0·01	0·91	+18·21	0 55 10·90
28 Crateris,	21	52·83	0·05	0·91	18·74	12·43
North.	27	53·92	0·01	0·91	19·00	13·82
	30	49·72	0·10	0·91	19·09	9·62
	June 2	54·17	0·00	0·91	19·15	14·23
	4	54·96	0·01	0·91	19·17	15·03
	6	54·37	0·01	0·92	19·17	14·45
	8	53·57	0·01	0·92	19·16	13·64
	18	51·84	0·01	0·92	18·95	11·70
	21	52·68	0·01	0·92	18·82	12·41
	23	52·19	0·01	0·92	18·71	11·81
	25	52·78	0·01	0·92	18·61	12·30
	27	52·34	0·00	0·91	+18·49	11·74
					Mean	0 55 12·62

Face of Sector West.						Resulting Error of Collimation.	Resulting Mean Zenith Distance, 1838, Jan. 0, completely corrected; and Position with regard to the Zenith.
Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.		
May 15	2° 56′ 49″·40	0″·02	2″·94	+17″·52	2° 57′ 9″·84	″	° ′ ″
17	47·47	0·03	2·96	17·61	8·01		
22	48·80	0·19	2·95	17·82	9·38		
26	46·68	0·14	2·98	17·99	7·51		
28	45·49	0·09	2·95	17·94	6·29		
29	47·76	0·07	2·97	17·95	8·61	24·28	2 57 32·61
June 7	46·58	0·16	2·98	17·88	7·28		North.
17	46·53	0·00	2·98	17·52	7·03		
19	47·86	0·00	2·97	17·42	8·25		
22	48·85	0·05	3·01	17·23	9·04		
24	48·85	0·04	3·00	17·09	8·90		
26	49·84	0·03	2·98	+16·93	9·72		
				Mean	2 57 8·32		
May 15	0 54 7·01	0·01	0·90	+18·36	0 54 26·26		
17	6·71	0·01	0·91	18·50	26·11		
26	(0·19)	0·04	0·92	18·97			
28	5·43	0·03	0·91	19·03	25·34		
29	7·55	0·02	0·91	19·06	27·50		
June 7	5·62	0·01	0·92	19·17	25·70	23·25	0 54 49·37
17	5·08	0·00	0·92	18·99	24·99		North.
19	6·02	0·00	0·91	18·91	25·84		
22	6·47	0·01	0·92	18·77	26·15		
24	6·22	0·01	0·92	18·66	25·79		
26	8·20	0·01	0·91	+18·54	27·64		
				Mean	0 54 26·13		

Star's No. in Ast. Soc. Cat., Name, and Position with regard to the Zenith.	FACE OF SECTOR EAST.					
	Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.
A. S. C. 1433,	May 13	4° 13′ 12″·39	0″·07	4″·24	+19″·45	4° 12′ 57″·11
u Centauri,	27	12·34	0·05	4·26	20·79	55·76
South.	30	13·23	0·51	4·24	20·99	55·97
	June 4	11·84	0·05	4·23	21·27	54·75
	6	12·53	0·06	4·28	21·36	55·39
	8	14·12	0·04	4·26	21·43	56·91
	18	13·13	0·03	4·28	21·58	55·80
	21	14·02	0·04	4·31	21·57	56·72
	23	14·51	0·03	4·31	21·53	57·26
	25	13·77	0·06	4·26	21·49	56·48
	27	14·12	0·01	4·24	+21·43	56·92
					Mean	4 12 56·28
A. S. C. 1527,	May 21	1 55 59·32	0·11	1·95	+19·93	1 55 41·23
ι Centauri,	27	57·84	0·02	1·95	20·48	39·29
South.	June 5	56·55	0·03	1·94	21·18	37·28
	6	58·43	0·03	1·96	21·27	39·09
	8	58·63	0·02	1·95	21·38	39·18
	18	59·32	0·02	1·96	21·81	39·45
	21	58·78	0·02	1·97	21·89	38·84
	23	61·05	0·01	1·97	21·93	41·08
	25	60·31	0·03	1·96	21·95	40·29
	27	61·40	0·01	1·94	+21·96	41·37
					Mean	1 55 39·71

Face of Sector West.						Resulting Error of Collimation.	Resulting Mean Zenith Distance, 1838, Jan. 0, completely corrected; and Position with regard to the Zenith.
Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.		
May 12	4° 13′ 57″·57	0″·00	4″·24	+19″·33	4° 13′ 42″·48	″	° ′ ″
15	58·60	0·03	4·21	19·68	43·10		
26	61·97	0·22	4·27	20·73	45·29		
June 7	60·93	0·01	4·27	21·41	43·78		
17	62·91	0·01	4·27	21·58	45·59		
19	61·03	0·00	4·26	21·58	43·71		
22	62·16	0·07	4·30	21·55	44·84	23·86	4 13 20·14 South.
24	61·22	0·06	4·30	21·51	43·95		
26	60·43	0·05	4·26	+21·46	43·18		
				Mean	4 13 43·99		
May 12	1 56 44·60	0·00	1·94	+18·77	1 56 27·77		
26	49·00	0·10	1·96	20·37	30·49		
29	48·16	0·05	1·95	20·65	29·41		
June 7	48·56	0·01	1·96	21·32	29·19		
17	49·69	0·00	1·96	21·77	29·88		
19	49·30	0·00	1·95	21·84	29·41	24·77	1 56 4·48 South.
24	49·25	0·03	1·97	21·94	29·25		
26	48·56	0·02	1·95	+21·96	28·53		
				Mean	1 56 29·24		

Star's No. in Ast. Soc. Cat., Name, and Position with regard to the Zenith.	Face of Sector East.					
	Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.
A. S. C. 1562,	May 16	° ′ ″ 1 41 59·18	″ 0·02	″ 1·69	″ +18·53	° ′ ″ 1 42 19·38
i Centauri,	21	58·29	0·09	1·70	19·05	18·95
North.	27	59·52	0·02	1·70	19·60	20·80
	June 4	60·21	0·02	1·69	20·21	22·09
	5	59·92	0·02	1·69	20·28	21·87
	6	59·97	0·02	1·71	20·34	22·00
	8	59·47	0·02	1·71	20·46	21·62
	18	58·78	0·01	1·71	20·91	21·39
	21	60·02	0·01	1·72	20·99	22·72
	23	56·80	0·01	1·72	21·03	19·54
	25	58·04	0·02	1·71	+21·07	20·80
					Mean	1 42 21·02
A. S. C. 1579,	May 13	1 44 2·91	0·02	1·73	+18·09	1 44 22·71
k Centauri,	16	1·87	0·02	1·73	18·44	22·02
North.	21	2·26	0·09	1·73	18·97	22·87
	27	2·86	0·02	1·74	19·53	24·11
	June 4	4·14	0·02	1·73	20·15	26·00
	5	3·40	0·02	1·73	20·22	25·33
	6	2·86	0·02	1·75	20·28	24·87
	8	2·31	0·02	1·74	20·41	24·44
	18	1·67	0·01	1·74	20·88	24·28
	21	2·37	0·01	1·76	20·97	25·09
	23	43 59·94	0·01	1·76	21·02	22·70
	25	60·34	0·02	1·74	21·07	23·13
	27	60·09	0·00	1·73	+21·09	22·91
					Mean	1 44 23·88

Face of Sector West.						Resulting Error of Collimation.	Resulting Mean Zenith Distance, 1838, Jan. 0, completely corrected; and Position with regard to the Zenith.
Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observations.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.		
	° ′ ″	″	″	″	° ′ ″	″	° ′ ″
May 12	1 41 15·44	0·00	1·70	+18·07	1 41 35·21		
15	14·25	0·01	1·68	18·41	34·33		
17	13·10	0·02	1·70	18·63	33·41		
26	10·68	0·08	1·71	19·52	31·83		
29	11·92	0·04	1·70	19·77	33·35		
June 7	9·20	0·01	1·71	20·40	31·30		
17	9·05	0·00	1·71	20·87	31·63		
19	9·54	0·00	1·70	20·93	32·17	24·02	1 41 57·00
22	9·80	0·03	1·72	21·01	32·50		North.
24	10·14	0·02	1·72	21·05	32·89		
26	11·52	0·02	1·70	+21·08	34·28		
				Mean	1 41 32·99		
May 12	1 43 18·18	0·00	1·73	+17·97	1 43 37·88		
15	16·45	0·01	1·72	18·33	36·49		
22	13·72	0·11	1·73	19·06	34·40		
26	12·14	0·08	1·74	19·44	33·24		
29	14·51	0·04	1·73	19·70	35·90		
June 7	11·25	0·01	1·74	20·34	33·32		
14	11·64	0·07	1·75	20·72	34·04		
17	11·94	0·00	1·75	20·84	34·53	24·37	1 43 59·51
19	11·89	0·00	1·74	20·91	34·54		North.
22	12·00	0·03	1·75	21·00	34·72		
24	13·13	0·02	1·75	21·04	35·90		
26	13·92	0·02	1·74	+21·08	36·72		
				Mean	1 43 35·14		

Star's No. in Ast. Soc. Cat., Name, and Position with regard to the Zenith.	Face of Sector East.					
	Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.
A. S. C. 1604,	May 13	1° 38′ 47″·04	0″·02	1″·66	+18″·10	1° 38′ 30″·58
θ Centauri,	16	45·95	0·02	1·65	18·50	29·08
South.	21	47·73	0·12	1·66	19·13	30·14
	27	46·74	0·02	1·67	19·81	28·58
	June 4	47·04	0·02	1·65	20·60	28·07
	5	46·84	0·02	1·65	20·69	27·78
	6	47·19	0·03	1·67	20·77	28·06
	8	46·05	0·02	1·67	20·93	26·77
	18	48·82	0·02	1·67	21·60	28·87
	21	48·77	0·02	1·67	21·76	28·66
	23	50·40	0·01	1·68	21·84	30·23
	25	50·05	0·03	1·67	21·92	29·77
	27	51·34	0·01	1·66	+22·00	30·99
					Mean	1 38 29·04
A. S. C. 1661,	May 13	0 32 54·94	0·01	0·56	+17·03	0 32 38·46
c^1 Centauri,	16	54·24	0·01	0·56	17·42	37·37
South.	18	57·11	(0·12)*	0·56	17·67	39·88
	21	54·84	0·03	0·56	18·03	37·34
	27	55·53	0·01	0·56	18·72	37·36
	June 8	55·63	0·01	0·56	19·89	36·29
	18	57·90	0·00	0·56	20·65	37·81
	21	56·76	0·00	0·57	20·84	36·49
	23	58·15	0·00	0·57	20·95	37·77
	25	58·49	0·01	0·56	21·06	37·98
	27	59·98	0·00	0·56	+21·18	39·36
					Mean	0 32 37·83

* See the remark following the observations of May 18, page 143.

Face of Sector West.						Resulting Error of Collimation.	Resulting Mean Zenith Distance, 1838, Jan. 0, completely corrected; and Position with regard to the Zenith.
Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.		
	° ′ ″	″	″	″	° ′ ″	″	° ′ ″
May 12	1 39 32·32	0·00	1·66	+17·96	1 39 16·02		
15	34·39	0·01	1·65	18·37	17·66		
17	34·79	0·02	1·66	18·63	17·80		
22	35·88	0·14	1·65	19·25	18·14		
26	37·46	0·11	1·67	19·70	19·32		
29	36·57	0·05	1·66	20·02	18·16		
June 7	39·83	0·01	1·67	20·86	20·63		
17	39·63	0·01	1·67	21·54	19·75		
19	39·34	0·00	1·66	21·67	19·33	24·70	1 38 53·74 South.
22	38·89	0·03	1·68	21·81	18·73		
24	38·74	0·03	1·68	21·88	18·51		
26	(37·56)	0·02	1·67	+21·96	17·25		
				Mean	1 39 18·44		
May 12	0 33 39·18	0·00	0·56	+16·90	0 33 22·84		
15	40·41	0·00	0·55	17·29	23·67		
17	41·90	0·01	0·56	17·55	24·90		
22	43·58	0·04	0·56	18·15	25·95		
26	43·43	0·03	0·56	18·37	25·59		
29	41·40	0·01	0·56	18·93	23·02		
June 7	44·52	0·04	0·56	19·80	25·24		
17	46·05	0·00	0·56	20·57	26·04		
19	45·46	0·00	0·56	20·72	25·30	23·40	0 33 1·23 South.
22	45·06	0·01	0·56	20·90	24·71		
24	45·16	0·01	0·56	21·01	24·70		
26	44·17	0·01	0·56	+21·11	23·61		
				Mean	0 33 24·63		

Star's No. in Ast. Soc. Cat., Name, and Position with regard to the Zenith.	Face of Sector East.					
	Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.
A. S. C. 1742,	May 13	2° 20′ 51″·71	0″·02	2″·36	+15″·60	2° 20′ 38″·45
φ^2 Lupi,	18	52·79	(0·53)*	2·36	16·27	38·35
South.	21	52·79	0·23	2·36	16·65	38·27
	June 6	52·99	0·03	2·38	18·52	36·82
	8	51·21	0·02	2·37	18·73	34·83
	18	55·17	0·02	2·38	19·67	37·86
	21	54·67	0·02	2·40	19·93	37·12
	23	56·35	0·01	2·40	20·09	38·65
	25	55·37	0·03	2·38	+20·24	37·48
					Mean	2 20 37·54
A. S. C. 1774,	May 13	4 40 55·02	0·04	4·69	+15·12	4 41 14·79
40 Libræ,	18	56·35	0·98	4·70	15·56	15·63
North.	21	56·75	0·24	4·70	15·82	17·03
	27	56·16	0·05	4·70	16·30	17·11
	June 6	56·06	0·06	4·74	17·03	17·77
	8	58·73	0·04	4·72	17·17	20·58
	18	53·68	0·03	4·73	17·77	16·15
	21	55·56	0·04	4·77	17·93	18·22
	23	54·28	0·02	4·77	18·02	17·05
	25	53·68	0·06	4·73	18·12	16·47
	27	53·19	0·01	4·70	+18·21	16·09
					Mean	4 41 16·99

* See the remark following the observations of May 18, page 143.

Face of Sector West.						Resulting Error of Collimation.	Resulting Mean Zenith Distance, 1838, Jan. 0, completely corrected; and Position with regard to the Zenith.
Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.		
	° ′ ″	″	″	″	° ′ ″	″	° ′ ″
May 12	2 21 37·28	0·00	2·36	+15·46	2 21 24·18		
17	39·66	0·02	2·36	16·13	25·87		
22	40·99	0·16	2·35	16·78	26·40		
29	39·95	0·06	2·36	17·63	24·62		
June 7	41·83	0·17	2·38	18·63	25·41		
17	43·81	0·00	2·38	19·59	26·60		
19	43·61	0·00	2·37	19·76	26·22		
22	43·17	0·04	2·39	20·01	25·51	23·96	2 21 1·50 South.
24	42·77	0·03	2·39	20·16	24·97		
26	42·67	0·03	2·37	+20·31	24·70		
				Mean	2 21 25·45		
May 12	4 40 12·36	0·00	4·69	+15·02	4 40 32·07		
15	11·80	0·03	4·66	15·29	31·72		
17	10·78	0·04	4·70	15·47	30·91		
22	10·18	0·30	4·67	15·90	30·45		
26	8·30	0·22	4·73	16·22	29·03		
29	9·44	0·11	4·70	16·46	30·49		
June 7	8·55	0·32	4·73	17·10	30·06		
17	4·75	0·01	4·73	17·71	27·18	23·54	4 40 53·46 North.
19	6·03	0·00	4·71	17·82	28·56		
22	6·23	0·07	4·75	17·97	28·88		
24	6·97	0·06	4·75	+18·07	29·73		
				Mean	4 40 29·92		

Star's No. in Ast. Soc. Cat., Name, and Position with regard to the Zenith.	Face of Sector East.					
	Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.
A. S. C. 1797,	May 13	0° 47′ 44″·06	0″·01	0″·79	+14″·48	0° 47′ 59″·32
λ Lupi,	18	45·15	0·17	0·79	15·02	60·79
North.	21	43·96	0·04	0·79	15·34	60·05
	27	44·70	0·01	0·79	15·94	61·42
	June 6	43·17	0·01	0·80	16·89	60·85
	8	45·44	0·01	0·79	17·06	63·28
	18	40·80	0·01	0·80	17·88	59·47
	21	42·03	0·01	0·80	18·10	60·92
	23	41·29	0·00	0·80	18·24	60·33
	27	40·50	0·00	0·79	+18·50	59·79
					Mean	0 48 0·62
A. S. C. 1821,	May 18	4 0 7·91	0·93	4·02	+14·45	3 59 56·55
η Lupi,	21	6·77	0·23	4·03	14·85	55·72
South.	27	7·81	0·04	4·03	15·61	56·19
	June 6	6·82	0·05	4·06	16·81	54·02
	8	6·53	0·04	4·04	17·04	53·49
	18	9·89	0·03	4·05	18·11	55·80
	21	9·94	0·04	4·08	18·41	55·57
	23	10·48	0·02	4·08	18·60	55·94
	25	10·18	0·05	4·05	18·79	55·39
	27	11·22	0·01	4·03	+18·97	56·27
					Mean	3 59 55·49

FACE OF SECTOR WEST.						Resulting Error of Collimation.	Resulting Mean Zenith Distance, 1838, Jan. 0, completely corrected; and Position with regard to the Zenith.
Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.		
	° ′ ″	″	″	″	° ′ ″	″	° ′ ″
May 12	0 46 58·58	0·00	0·79	+14·37	0 47 13·74		
17	59·23	0·01	0·79	14·91	14·92		
22	56·21	0·05	0·79	15·44	12·39		
26	56·21	0·04	0·80	15·85	12·82		
29	56·80	0·02	0·79	16·15	13·72		
June 7	56·21	0·00	0·80	16·97	13·98		
17	52·65	0·00	0·80	17·80	11·25	23·61	0 47 37·01
19	53·59	0·00	0·79	17·95	12·33		North.
22	54·82	0·01	0·80	18·17	13·78		
24	54·33	0·01	0·80	18·31	13·43		
26	55·86	0·01	0·79	+18·45	15·09		
				Mean	0 47 13·40		
May 12	4 0 51·21	0·00	4·02	+13·66	4 0 41·57		
17	54·97	0·04	4·03	14·32	44·64		
22	55·76	0·28	4·01	14·97	44·52		
26	55·81	0·21	4·06	15·48	44·18		
29	55·66	0·10	4·03	15·85	43·74		
June 7	56·95	0·00	4·05	16·92	44·08	24·18	4 0 19·67
17	60·36	0·00	4·06	18·01	46·41		South.
24	57·24	0·06	4·07	18·70	42·45		
26	57·94	0·05	4·05	+18·88	43·06		
				Mean	4 0 43·85		

Star's No. in Ast. Soc. Cat., Name, and Position with regard to the Zenith.	Face of Sector East.					
	Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.
A. S. C. 1835,	May 13	2° 25′ 48″·44	0″·02	2″·44	+13″·58	2° 25′ 37″·28
θ Lupi,	18	49·14	0·55	2·44	14·18	36·85
South.	21	48·44	0·14	2·44	14·54	36·20
	27	48·99	0·03	2·45	15·24	36·17
	June 4	47·65	0·03	2·44	16·11	33·95
	6	48·49	0·03	2·47	16·33	34·60
	18	51·56	0·02	2·46	17·53	36·47
	21	50·82	0·02	2·48	17·80	35·48
	23	51·90	0·01	2·48	17·98	36·39
	25	51·31	0·03	2·46	18·15	35·59
	27	52·00	0·01	2·44	+18·32	36·11
					Mean	2 25 35·92
A. S. C. 1866,	May 13	3 24 55·65	0·03	3·42	+13·37	3 25 12·41
p Scorpii,	18	54·86	0·72	3·42	13·78	11·34
North.	21	57·23	0·18	3·42	14·02	14·49
	27	57·73	0·03	3·42	14·49	15·61
	June 6	57·13	0·04	3·45	15·22	15·76
	18	54·17	0·03	3·44	16·02	13·60
	25	52·49	0·04	3·44	16·44	12·33
	27	52·59	0·01	3·42	+16·55	12·55
					Mean	3 25 13·51

Face of Sector West.							
Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.	Resulting Error of Collimation.	Resulting Mean Zenith Distance, 1838, Jan. 0, completely corrected; and Position with regard to the Zenith.
	° ′ ″	″	″	″	° ′ ″	″	° ′ ″
May 12	2 26 32·69	0·00	2·44	+13·46	2 26 21·67		
17	35·21	0·03	2·45	14·07	23·56		
22	36·00	0·17	2·44	14·66	23·61		
26	37·48	0·12	2·46	15·12	24·70		
29	37·09	0·06	2·45	15·46	24·02		
June 7	38·27	0·00	2·46	16·44	24·29	24·05	2 25 59·97 South.
17	41·63	0·00	2·46	17·43	26·66		
22	40·15	0·04	2·47	17·89	24·69		
24	38·92	0·03	2·47	18·07	23·29		
26	39·46	0·03	2·46	+18·23	23·66		
				Mean	2 26 24·02		
May 12	3 24 11·06	0·00	3·42	+13·29	3 24 27·77		
15	9·48	0·02	3·39	13·53	26·38		
17	9·48	0·03	3·42	13·70	26·57		
22	6·76	0·22	3·41	14·10	24·05		
26	6·81	0·16	3·45	14·41	24·51		
29	8·20	0·08	3·42	14·64	26·18	24·00	3 24 49·52 North.
June 7	5·43	0·00	3·45	15·29	24·17		
17	4·73	0·00	3·45	15·96	24·14		
19	4·64	0·00	3·43	16·08	24·15		
24	5·87	0·04	3·46	16·38	25·67		
26	7·21	0·04	3·44	+16·49	27·10		
				Mean	3 24 25·52		

Star's No. in Ast. Soc. Cat., Name, and Position with regard to the Zenith.	Face of Sector East.					
	Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.
A. S. C. 1889,	May 13	0° 25′ 12″·01	0″·00	0″·43	+ 12″·42	0° 24′ 60″·02
α Normæ,	18	13·74	0·09	0·43	12·92	61·16
South.	27	12·66	0·00	0·43	13·80	59·29
	June 6	12·26	0·01	0·43	14·73	57·95
	18	13·74	0·00	0·43	15·79	58·38
	21	14·43	0·00	0·43	16·04	58·82
	23	15·03	0·00	0·43	16·20	59·26
	25	16·41	0·01	0·43	16·36	60·47
	27	17·10	0·00	0·43	+16·51	61·02
					Mean	0 24 59·60
A. S. C. 1915,	May 13	0 4 3·89	0·00	0·08	+11·43	0 3 52·54
ε Scorpii,	18	3·65	0·02	0·08	11·87	51·84
South.	21	2·86	0·00	0·08	12·13	50·81
	27	3·40	0·00	0·08	12·66	50·82
	June 4	2·26	0·00	0·08	13·35	48·99
	6	3·20	0·00	0·08	13·52	49·76
	18	5·13	0·00	0·08	14·52	50·69
	21	4·44	0·00	0·08	14·76	49·76
	23	5·53	0·00	0·08	14·92	50·69
	25	6·51	0·00	0·08	15·07	51·52
	27	6·12	0·00	0·08	+15·23	50·97
					Mean	0 3 50·76

Face of Sector West.							
Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.	Resulting Error of Collimation.	Resulting Mean Zenith Distance, 1838, Jan. 0, completely corrected; and Position with regard to the Zenith.
May 12	0° 25′ 56″·95	0″·00	0″·43	+12″·32	0° 25′ 45″·06	″	° ′ ″
15	57·54	0·00	0·42	12·62	45·34		
17	58·88	0·00	0·43	12·82	46·49		
22	59·91	0·03	0·43	13·31	47·00		
29	59·52	0·01	0·43	13·99	45·95		
June 7	60·70	0·00	0·43	14·83	46·30		
17	63·47	0·00	0·43	15·71	48·19	23·49	0 25 23·09
19	62·83	0·00	0·43	15·87	47·39		South.
22	64·16	0·01	0·43	16·12	48·46		
24	62·19	0·01	0·43	16·28	46·33		
26	61·74	0·00	0·43	+16·43	45·74		
				Mean	0 25 46·57		
May 12	0 4 48·83	0·00	0·08	+11·34	0 4 37·57		
15	50·16	0·00	0·07	11·60	38·63		
17	51·00	0·00	0·08	11·78	39·30		
22	51·70	0·00	0·08	12·21	39·57		
26	54·66	0·00	0·08	12·57	42·17		
29	52·39	0·00	0·08	13·02	39·45		
June 7	52·93	0·00	0·08	13·61	39·40		
14	55·06	0·00	0·08	14·19	40·95		
17	55·06	0·00	0·08	14·44	40·70	24·49	0 4 15·25
19	54·91	0·00	0·08	14·60	40·39		South.
22	55·45	0·00	0·08	14·84	40·69		
24	53·62	0·00	0·08	14·99	38·71		
26	53·97	0·00	0·08	+15·15	38·90		
				Mean	0 4 39·73		

Star's No. in Ast. Soc. Cat., Name, and Position with regard to the Zenith.	Face of Sector East.					
	Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.
A. S. C. 1947,	May 13	0° 2′ 13″·47	0″·00	0″·03	+10″·62	0° 2′ 24″·12
k Scorpii,	21	13·27	0·00	0·03	11·26	24·56
North.	27	13·96	0·00	0·03	11·74	25·73
	June 6	13·77	0·00	0·03	12·54	26·34
	18	12·28	0·00	0·03	13·50	25·81
	21	11·69	0·00	0·03	13·73	25·45
	25	10·01	0·00	0·03	14·04	24·08
	27	9·88	0·00	0·03	+14·19	24·10
					Mean	0 2 25·02
A. S. C. 1969,	May 13	1 27 5·46	0·01	1·45	+10·12	1 27 17·02
u Scorpii,	21	6·85	0·08	1·45	10·63	18·85
North.	27	6·45	0·01	1·45	11·03	18·92
	June 6	6·85	0·02	1·44	11·71	19·98
	18	4·72	0·01	1·46	12·53	18·70
	21	4·77	0·01	1·47	12·73	18·96
	23	4·27	0·01	1·47	12·86	18·59
	25	3·09	0·02	1·46	13·00	17·53
	27	3·38	0·00	1·45	+13·13	17·96
					Mean	1 27 18·50

Face of Sector West.							
Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.	Resulting Error of Collimation.	Resulting Mean Zenith Distance, 1838, Jan. 0, completely corrected; and Position with regard to the Zenith.
	° ′ ″	″	″	″	° ′ ″	″	° ′ ″
May 12	0 1 28·43	0·00	0·03	+10·53	0 1 38·99		
15	26·98	0·00	0·03	10·78	37·79		
17	25·91	0·00	0·03	10·94	36·88		
22	21·96	0·00	0·03	11·34	33·33		
26	21·96	0·00	0·03	11·66	33·65		
29	24·28	0·00	0·03	11·90	36·21		
June 7	23·39	0·00	0·03	12·62	36·04	24·63	0 2 0·39 North.
14	21·66	0·00	0·03	13·18	34·87		
17	20·48	0·00	0·03	13·42	33·93		
24	21·96	0·00	0·03	+13·96	35·95		
				Mean	0 1 35·76		
May 12	1 26 21·47	0·00	1·45	+10·05	1 26 32·97		
15	21·12	0·01	1·44	10·24	32·79		
17	18·54	0·01	1·45	10·37	30·35		
22	19·87	0·09	1·44	10·73	31·95		
26	18·70	0·07	1·46	10·94	31·03		
29	19·09	0·03	1·45	11·17	31·68		
June 7	17·71	0·00	1·46	11·78	30·95	23·54	1 26 54·96 North.
14	18·01	0·06	1·46	12·25	31·66		
17	15·14	0·00	1·46	12·46	29·06		
22	15·98	0·02	1·47	12·80	30·23		
24	16·97	0·01	1·47	12·93	31·36		
26	18·50	0·02	1·46	+13·07	33·01		
				Mean	1 26 31·42		

Star's No. in Ast. Soc. Cat., Name, and Position with regard to the Zenith.	Face of Sector East.					
	Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.
A. S. C. 2007,	May 13	3° 3′ 5″·61	0″·03	3″·07	+ 8″·41	3° 2′ 60″·24
λ Scorpii,	21	5·42	0·17	3·07	9·04	59·28
South.	27*	5·12	0·03	3·07	9·53	58·63
	June 6	3·34	0·04	3·09	10·39	56·00
	18	7·05	0·02	3·09	11·46	58·66
	21	6·80	0·03	3·11	11·74	58·14
	23	6·80	0·02	3·11	11·92	57·97
	25	8·58	0·04	3·09	12·10	59·53
	27	9·57	0·01	3·07	+12·28	60·35
					Mean	3 2 58·76
A. S. C. 2043,	May 13	3 3 25·98	0·03	3·07	+ 7·35	3 3 21·67
γ Telescopii,	21	24·30	0·17	3·08	7·80	19·41
South.	June 18	26·77	0·02	3·09	10·11	19·73
	21	25·98	0·03	3·12	10·37	18·70
	23	27·36	0·02	3·12	10·55	19·91
	25	28·11	0·04	3·09	10·72	20·44
	27	28·30	0·01	3·07	+10·90	20·46
					Mean	3 3 20·05

Face of Sector West.						Resulting Error of Collimation.	Resulting Mean Zenith Distance, 1838, Jan. 0, completely corrected; and Position with regard to the Zenith.
Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.		
May 12	3° 3′ 49″·90	0″·00	3″·07	+ 8″·33	3° 3′ 44″·64	″	° ′ ″
15	50·79	0·02	3·04	8·56	45·25		
17	52·72	0·03	3·07	8·72	47·04		
22	52·97	0·21	3·06	9·12	46·70		
26	55·64	0·16	3·09	9·45	49·12		
29	54·26	0·08	3·07	9·70	47·55		
June 7	55·54	0·00	3·09	10·48	48·15	24·14	3 3 22·89
14	56·18	0·13	3·10	11·10	48·05		South.
17	57·42	0·00	3·09	11·38	49·13		
22	55·39	0·05	3·12	11·83	46·63		
24	54·80	0·04	3·11	12·01	45·86		
26	55·39	0·04	3·09	+12·19	46·25		
				Mean	3 3 47·03		
May 12	3 4 9·97	0·00	3·07	+ 7·29	3 4 5·75		
15	10·27	0·02	3·05	7·49	5·81		
17	12·64	0·03	3·08	7·62	8·07		
22	13·98	0·21	3·06	7·97	8·86		
26	14·33	0·16	3·10	8·26	9·01		
29	12·79	0·08	3·08	8·48	7·31		
June 7	15·31	0·00	3·10	9·19	9·22	23·95	3 3 44·00
14	16·45	0·13	3·10	9·77	9·65		South.
17	16·99	0·00	3·10	10·02	10·07		
22	15·66	0·05	3·12	10·46	8·27		
24	14·13	0·04	3·11	10·63	6·57		
26	14·42	0·04	3·09	+10·81	6·66		
				Mean	3 4 7·94		

Star's No. in Ast. Soc. Cat., Name, and Position with regard to the Zenith.	Face of Sector East.					
	Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.
A. S. C. 2079,	May 13	3° 30′ 21″·50	0″·03	3″·51	+ 7″·62	3° 30′ 32″·60
γ λ Sagittarii,	21	22·64	0·19	3·51	7·80	33·76
North.	27	23·53	0·03	3·51	7·97	34·98
	June 6	24·42	0·04	3·54	8·28	36·20
	18	20·56	0·03	3·53	8·75	32·81
	21	21·41	0·03	3·56	8·88	33·82
	23	21·45	0·02	3·56	8·97	33·96
	25	20·02	0·04	3·53	9·06	32·57
	27	20·07	0·01	3·51	+ 9·15	32·72
					Mean	3 30 33·71
A. S. C. 2101,	May 13	2 52 31·96	0·02	2·89	+ 5·56	2 52 29·27
β Telescopii,	21	31·86	0·10	2·89	5·92	28·73
South.	27	30·38	0·02	2·89	6·23	27·02
	June 6	30·72	0·02	2·92	6·84	26·78
	18	32·15	0·01	2·90	7·68	27·36
	21	31·22	0·02	2·94	7·90	26·24
	23	32·65	0·01	2·93	8·06	27·51
	25	34·82	0·02	2·91	8·22	29·49
	27	34·33	0·01	2·89	+ 8·38	28·83
					Mean	2 52 27·91

Face of Sector West.						Resulting Error of Collimation.	Resulting Mean Zenith Distance, 1838, Jan. 0, completely corrected; and Position with regard to the Zenith.
Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.		
	° ′ ″	″	″	″	° ′ ″	″	° ′ ″
May 12	3 29 35·53	0·00	3·51	+ 7·06	3 29 46·10		
15	33·80	0·02	3·48	7·66	44·92		
17	33·95	0·03	3·51	7·71	45·14		
22	33·50	0·22	3·50	7·83	44·61		
26	32·71	0·17	3·54	7·94	44·02		
29	33·41	0·08	3·51	8·03	44·87		
June 7	31·53	0·00	3·54	8·32	43·39	24·64	3 30 09·08
14	31·23	0·14	3·54	8·58	43·21		North.
17	31·13	0·00	3·54	8·70	43·37		
22	30·14	0·06	3·57	8·92	42·57		
24	32·66	0·04	3·56	9·01	45·19		
26	33·31	0·04	3·53	+ 9·10	45·90		
				Mean	3 29 44·44		
May 12	2 53 17·97	0·00	2·89	+ 5·51	2 53 15·35		
15	17·24	0·01	2·87	5·64	14·46		
17	18·87	0·02	2·89	5·73	16·01		
22	20·20	0·13	2·88	5·97	16·98		
26	20·80	0·09	2·92	6·18	17·45		
29	19·81	0·05	2·89	6·34	16·31		
June 7	21·09	0·00	2·92	6·90	17·11	24·23	2 52 52·14
14	21·59	0·08	2·92	7·38	17·05		South.
17	23·07	0·00	2·91	7·60	18·38		
22	21·39	0·03	2·94	7·98	16·32		
24	20·80	0·03	2·93	8·14	15·56		
26	20·80	0·02	2·91	+ 8·30	15·39		
				Mean	2 53 16·36		

Star's No. in Ast. Soc. Cat., Name, and Position with regard to the Zenith.	Face of Sector East.					
	Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.
A. S. C. 2110,	May 13	0° 31′ 37″·98	0″·01	0″·53	+ 5″·63	0° 31′ 32″·87
ε Sagittarii,	21	38·22	0·03	0·54	5·87	32·86
South.	27	37·48	0·01	0·53	6·07	31·93
	June 6	37·38	0·01	0·54	6·51	31·40
	18	38·08	0·00	0·54	7·15	31·47
	21	38·08	0·00	0·54	7·33	31·29
	23	38·82	0·00	0·54	7·46	31·90
	25	40·65	0·01	0·54	7·58	33·60
	27	40·94	0·00	0·53	+ 7·71	33·76
					Mean	0 31 32·34
A. S. C. 2741,	June 18	3 27 5·66	0·03	3·47	−14·73	3 26 54·37
α Piscis Australis	21	6·15	0·03	3·52	15·18	54·46
(Fomalhaut),	23	4·57	0·02	3·51	−15·44	52·62
North.						
					Mean	3 26 53·82

Face of Sector West.						Resulting Error of Collimation.	Resulting Mean Zenith Distance, 1838, Jan. 0, completely corrected; and Position with regard to the Zenith.
Day of Observation, 1838.	Apparent Zenith Distance from unreduced Observation.	Reduction for Azimuthal Error.	Refraction.	Precession, Aberration, and Nutation.	Resulting Mean Zenith Distance, 1838, Jan. 0, and Mean of separate Results uncorrected for Error of Collimation.		
	° ′ ″	″	″	″	° ′ ″	″	° ′ ″
May 12	0 32 23·45	0·00	0·53	+ 5·61	0 32 18·37		
15	24·25	0·00	0·53	5·68	19·10		
17	24·94	0·01	0·53	5·74	19·72		
22	25·63	0·04	0·53	5·89	20·23		
26	25·43	0·03	0·54	6·04	19·90		
29	24·64	0·01	0·54	6·15	19·02	23·73	0 31 56·07
June 7	26·17	0·00	0·54	6·56	20·15		South.
14	27·51	0·02	0·54	6·92	21·11		
17	28·94	0·00	0·54	7·09	22·39		
22	26·77	0·01	0·54	7·39	19·91		
24	25·93	0·01	0·54	7·52	18·94		
26	25·73	0·01	0·54	+ 7·65	18·61		
				Mean	0 32 19·79		
May 15	3 26 11·78	0·02	3·44	− 8·30	3 26 6·90		
29	15·14	0·08	3·46	11·23	7·29	23·74	3 26 30·08
June 17	16·27	0·00	3·48	14·58	5·17		North.
22	17·86	0·05	3·51	−15·31	6·01		
				Mean	3 26 6·34		

OPERATIONS

FOR

THE VERIFICATION AND EXTENSION

OF

THE ABBÉ DE LA CAILLE'S ARC OF THE MERIDIAN,

AT

THE CAPE OF GOOD HOPE.

PART III.

MEASUREMENT OF THE BASE.

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§ 1. Introductory History.*

While Mr. Maclear was engaged in the small surveys in the neighbourhood of Cape Town and Klyp Fontein, he informed me that he possessed no proper standard of length, and that there was no standard, of even the roughest kind, in the Cape Colony.

I considered it my duty to represent this deficiency to the Lords Commissioners of the Admiralty, and to state that, as well for the civil requirements of the colony, as for the contemplated geodetic survey, it was highly desirable that this deficiency should be supplied. On April 24, 1838, I received their Lordships' authority for the construction of two iron 10-feet bars, similar in size and general arrangement to those used by Colonel Colby (afterwards Major-General Colby), for reference in his measure of the base near Lough Foyle, in Ireland, and instructions were immediately given to Mr. Simms to proceed with the fabrication of these bars.

* This section is written by G. B. Airy, Esq., Astronomer Royal, excepting where quotation marks are annexed.—T. M.

In the autumn of the same year (1838), I received a letter from Mr. Maclear, dated June 1, 1838, giving me the result of an approximate calculation of the observations of La Caille's arc (contained in part II of this work), and summing up the conclusion as follows:—"It is clear that we cannot hope for any explanation [of the anomalous character of La Caille's result] from this re-observation of the amplitude. I am therefore fully prepared, on the receipt of my observations at home, to hear that the geodetic work is to be undertaken."

I proceeded without loss of time to make applications to various departments of the Government for the assistance which Mr. Maclear would require for the survey. Several circumstances, however, prevented me from acting efficiently till the year 1839 On Feb. 8, 1839, I ascertained from Colonel Colby, that it would be entirely agreeable to him, that the *compensation* bars invented by him, and used by him for the measure of the base by Lough Foyle, should be employed for the measure at the Cape of Good Hope. And, application having been made by the Lords Commissioners of the Admiralty to the Master-General and Board of Ordnance for the loan of these bars, I had the satisfaction of learning on May 17, 1839, that the Master-General and Board assented to this request. The official order for the delivery of the compensation bars was given on July 16.

In the month of April, 1839, observations (to be detailed hereafter) were made to determine the thermal expansion of the iron bars, and to compare their lengths with the lengths of the Astronomical Society's scale, and of Colonel Colby's two iron bars.

Previously to the month of July, the compensation bars had been placed by Colonel Colby in the hands of Mr. Simms, for general examination and small repairs, and cleaning,—and were then packed in travelling cases.

Every part of the base apparatus being thus ready for despatch, advantage was taken of the departure of Mr. Mann (recently appointed second assistant at the Cape of Good Hope) to place them under his care. Mr. Mann sailed, with the base apparatus in his charge, about the 20th of July, 1839.

The Board of Ordnance, in announcing their willingness to lend the compensation bars, had suggested that it might be desireable that an Officer of the Corps of Royal Engineers, who had already had some experience in the use of the compensation bars, should accompany them to the Cape of Good Hope, and should there assist in the measure of the base. The Lords Commissioners of the Admiralty having been pleased to refer this suggestion to me, I stated as my opinion, founded on the best information to which I had access, that it would be necessary to have the assistance of soldiers in many parts of the work,—and that for this reason, as well as for the more obvious reason of placing the bars under the immediate charge of a person accustomed to use them, it was desirable that an Officer of the Engineers should go to the Cape. Accordingly on October 11, 1839, Captain Henderson was selected for this service, and a small party of Sappers and Miners was placed under his command. Captain Henderson, however, (being then engaged in the survey of Scotland) did not sail with his party till April 8, 1840.

On December 10, 1839, I suggested to the Lords Commissioners of the Admiralty that it would be highly advantageous to the progress of the survey, that the Commander of the Garrison of Cape Town should be empowered to grant to Mr. Maclear the further assistance of soldiers from the garrison; and I learned by letter from the Secretary of the Admiralty, dated 1839, December 23, that their Lordships had used their influence with the Principal Secretary of State for the Colonies to this effect, and that he had complied most liberally with their request.

Captain Henderson and his party arrived at the Cape of Good Hope on July 6, 1840, and operations of various kinds, comparisons of the iron bars, trials of the compensation bars, preparations of supports and signals, &c., were immediately commenced by Mr. Maclear.

"On the 20th of August Mr. Maclear applied for, and obtained, from His Excellency Sir George Napier, the Governor and Commander-in-Chief at the Cape, the services of Lieutenant Cust, a talented young officer of the 25th Regiment of the line, and of a working party from the same regiment, consisting of a non-commissioned officer and twelve men: and on the 2nd of September the *whole* party moved off for Zwartland plain, where La Caille measured his base."

By a series of tentative operations Mr. Maclear, with the assistance of Mr. Mann, were led to fix upon a small swell of ground, without a stone or any distinguishing mark, either above the surface or below it to the depth of three feet, as the place of the west end of La Caille's base.* Starting from this point, with the known direction of the base-line, they were enabled to trace its whole course. The first $1\frac{1}{2}$ mile is good close hard ground, "excepting a sheet of water about 60 yards wide:" then it becomes sandy, and spongy from the great number of mole holes. It then declines rather abruptly towards the course of a winter river (the Salt River): a watercourse which in the summer consists merely of a series of stagnant brackish lagoons, but in the winter is a running stream. Mr. Maclear states that he had not seen this river before: nor is it mentioned at all by La Caille in the Memoirs de l'Academie, or in his Journal. It intersects the plain from a mile south of the Coggera farm to Uyle Kraal, a distance of five or six miles, "and finally opens into the Berg River."

The next mile of the base line is in part sandy and spongy, rising to the more elevated ridge on which the Coggera farm stands, but north of that farm. From this point to the eastern extremity the ground is hard. The valley of the winter river is entirely concealed from the eastern extremity, by the undulating of the Coggera ridge. Upon the whole, in Mr. Maclear's opinion, the line was not the best which might have been chosen. (*a*)

* "La Caille applies the terms *south* and *north* to his terminal points; but his line inclines more to the prime vertical than to the meridian.—T. M."

(*a*) "The explanation may in part be found by tracing his movements. On his scouring visit to the plain he travelled on horseback from Groenekloof, and the road was probably the same that now exists. From the point of the road where the line he afterwards measured crossed it, he could see to his left the quartz rock (which he fancied was

After consultation with Captain Henderson, Mr. Maclear felt himself at liberty to select a new line for his base. The considerations which weighed with him were the following:—1st. No error in La Caille's base could be detected by examination of the same line, since none of La Caille's works remain.

2nd. The spongy ground is unfit for the support of compensation bars upon tressels, however, well it might be suited for deal rods lying upon the ground.

3rd. Several portions of the line are too much marked by intervening undulations.

Mr. Maclear then examined a line two miles south of La Caille's line. It was in many respects good, but it was rejected, because the intervention of rising ground prevented the observation of one end of the line from the other end. Finally a line was adopted, beginning about 462 yards south-west of La Caille's west end, passing through La Caille's west end, "passing along the N.W. edge of the sheet of water," crossing the "Salt River," rising to the slightly elevated table land, then declining, and finally rising to the end.

The line is in general hard, and its parts are less screened from each other, and from the terminal points, than any other which could be found. The length of this line is about 8·1 miles. As viewed from the west end, the line is more inclined to the north than La Caille's by about two degrees.

As soon as the line was adopted, Mr. Maclear proceeded to build in an unoccupied house, about $\frac{3}{4}$ of a mile from its west extremity, two piers for carrying the microscopes, intended for comparison of the compensation bars, with the standard iron bar B ("standard A was left at the Observatory").

The microscopes of the compensation apparatus were examined and adjusted; and the pier defining the western extremity of the base was built.

It is a firm structure of masonry, enclosing an iron pipe into which a brass plug is fixed with lead (*a*), in the centre of the brass a platinum wire is inserted, and its end is polished off: upon this end is the dot. On October 21 the work of measuring was actually begun, and on October 27, 1701 feet were completed. The end of this measure being preserved by a dot, on a brass pin, carried by a strong picket,—the measure was recommenced from the west end on the 30th, and on November 4 the same point was again reached; and the coincidence of the measures was most satisfactory. After this time no measure was repeated, "except two or three sets of bars of doubtful accuracy."

As the measure proceeded, it was found that very great delay would be caused by bringing the standard bar, and compensation bars, to the microscopes fixed in the unoccupied house. Mr. Maclear, therefore, constructed a microscopic beam compass,

marble, journal page 174), but not the intervening sheet of water (Kotzee's Vlei); and to the right apparently even ground, ascending at the distance of six miles to a low ridge.

"He seems to have *commenced* the original measurement at the east end; and to a certainty at *that* end, when he repeated the measure with a cord, to discover if he had miscounted. The locality of his east point is not mentioned, either in his journal or memoir; its position, however, was on a swell, where there is a mound similar to, but larger than the one at the west end. The east terminal point of the new line is upon the same undulation, distant from La Caille's about 520 yards.—T. M."

(*a*) "The plug is hour glass shaped."

consisting of a trussed wooden frame, carrying two microscopes, which was transported to different points of the base, and was there mounted on temporary "bearings," built under temporary shelter.

The east end of the base was reached on April 5, 1841, and the permanent mark was established in nearly the same form as that at the west end, on April 20.

On April 24, the triangulation for connecting different portions of the base (in order to ascertain that no serious error, as by the omission of a bar, had occurred in any part) was commenced. The levelling of the base line, and the levelling from a point of the base line to the sea at Saldanha Bay, were conducted at nearly the same time. On June 21, Mr. Maclear finally returned to the Observatory.

On August 19, 1841, comparisons of the compensation bars with the two standard iron bars, and of the standard iron bars with each other, were commenced at the Observatory.

On December 13, 1842, the compensation bars, and the standard bar B (used for comparison with the compensation bars, throughout the measure of the base) were brought to Greenwich.

On September 12, 1843, B was compared with the two Ordnance bars (Col. Colby's) at Mr. Simm's shop; and in 1844, March and April, the comparisons were repeated at the Ordnance Survey Office, in Southampton.

§ 2. Measuring Apparatus.

As the account of a geodetic operation would be defective without a description of the instruments that were employed, the Astronomer Royal, Mr. Airy, applied to the late Colonel Colby for a copy from the three plates, which illustrate the elaborate details of the construction of the compensation bars, drawn up by Captain William Yolland, of the Royal Engineers, and published in the "Account of the measurement of the Loch Foyle Base." These plates are numbered XVII, XVIII, XIX, in the present work.

So much of Captain Yolland's descriptive letter press, as will explain the mechanical construction of the apparatus in reference to these plates, will be extracted from his work. For the record of the instructive temperature experiments, made prior to the determination of the positions of the compensation points, the work itself should be consulted.

The theory of the compensation point is exceedingly simple and beautiful; but the mechanical definition of its position is quite another matter. The expansion of metals in relation to the thermometer does not appear, in broad evidence, with the required precision. In the instance of a bar, the temperature of the portion in immediate contact with the bulb may be indicated on the scale; but in varying temperatures,—upon the conducting power of the metal, upon its volume and the condition of its surface,—will mainly depend whether the indications be partial or general.

An interesting experiment was made in comparison shed M, while measuring the Cape base, where there was no apparent reason for doubting the stability of the microscope pillars. The standard iron bar B was placed under the microscopes, and its varying lengths were compared with the varying temperatures, at short intervals, during twenty-four consecutive hours without a break. At 3 o'clock, p.m., when the *temperature* was stationary, the length of the bar was still increasing. Near 5 o'clock the *length* was stationary, but the temperature had *descended* several degrees. Shortly before sunrise the temperature was at its lowest point and stationary, but the length was still contracting. Near 8 o'clock, a.m., the temperature had risen several degrees, and the bar, which had been stationary for half an hour, was beginning to lengthen. On comparing the results, the mean *drag* of bar motion appeared to be nearly two hours *after* the temperature.

The long bulbs of the thermometers, bent to right angles with their stems, were in holes within the substance of the bar, surrounded by olive oil: these stems were screwed to the bars.

That the thermal connexion between the thermometer bulbs and the iron, through the medium of the olive oil, was not complete, is more than probable; yet, making due allowance for the imperfect connexion, there is a residual amount of time chargeable to the rate of absorption and radiation (the bar was painted) sufficient to vitiate comparisons in varying temperatures, where the bars are not nearly identical with respect to material, volume, shape, and surface covering. Hence the disheartening difficulties Colonel Colby encountered when fixing the positions of the compensation points, which will be found concisely and clearly recorded by Captain Yolland, in the account of the measurement of the Loch Foyle Base: their geometric positions, derived from the calculated expansions of the brass and iron, was an easy task to determine.

PLATE XVII. Fig 1.

* Let $a\,a'\;b\,b'$ be two bars of brass and iron joined together at their centres by a steel bar, $p\;q$, but free to expand from and contract towards their centres, independent of each other; $a\,n\;a'n'$ are flat steel tongues at the extremities of these bars, moving freely on conical brass pivots, allowing them to be inclined at small angles with the lines perpendicular to $a\,a'\;b\,b'$. At the temperature of 62° Fahrenheit, the bars are assumed to be precisely of the same length, and the tongues consequently at right angles to $a\,a'\;b\,b'$.

Imagine these bars to receive an increase of temperature and length, and, from the inequality of their expansions, the brass to become $c\,c'$, and the iron $d\,d'$, the position of the tongues now being $c\,d\,n\;c'd'n'$; it will then be apparent that if the points, $n\,n'$, be so determined that

$a\,c$	:	$b\,d$	: :	$a\,n$	:	$b\,n$
Expansion of Brass	:	Expansion of Iron	: :	distance of the compensated point from the Brass	:	distance of the compensated point from the Iron,

the positions of the points, $n\,n'$, can only vary within very narrow limits for any differences of temperature arising from atmospheric changes.

* Account of the measurement of the Loch Foyle Base, page 9.

In the construction of instruments on a similar principle, such, for example, as compensation pendulums or balances, it is assumed that the metals of which they are composed change their temperatures, and consequently their lengths, at an equal rate. But although this may be nearly true with respect to such instruments, and the error arising from a contrary supposition scarcely, if at all, appreciable, yet, with regard to the apparatus in question, composed of considerable masses of metal, and exposed to greater and more sudden variations of temperature, such an assumption might lead to very fallacious results.

It is obvious, from the nature of such a construction, that any difference in the temperatures of the two bars would produce a greater error in the distance between the two points, $n\,n'$, than a variation to the amount of the difference in the temperatures of a single bar would produce in its length; hence the necessity of adopting every possible precaution to guard against such an occurrence, and of devising some means of producing perfect equality between the two metals, so far as regards their rate of changing temperature.

The metals may have different capacities for heat—their surfaces may have different powers of radiation and absorption: two modes therefore presented themselves of producing the desired equality of temperature, either to have made the bars of different dimensions, or to have varied their surfaces till, by means of increased or diminished radiation and absorption, the desired equality was produced.

To have attempted the first mode would have required a previous determination of the extent of the inequality, and would thus have occasioned considerable delay. The second was therefore chosen, and a series of experiments were made on the heating and cooling of brass and iron cylinders, with a view of ascertaining the best means of so preparing their surfaces as to induce them to acquire or part with equal increments of temperature (when similarly exposed) in the same periods of time.*

1. " *Compensation Bar.*

The compensation bar consists of two bars, $a\,a'\ b\,b'$, of brass and iron, 10 feet, 1·5 inch long, 0·5 inch broad, and 1·5 inch deep, placed 1·125 inch apart, supported on brass rollers, $r\,r'$, at one-fourth and three-fourths of their length, and firmly fixed together at their centres by the transverse steel cylinders, $s\,s'$, 1·5 inch in diameter, and being free to expand from, or contract towards, their centres independently of each other. At the extremity of, and at right angles to, each of these bars is a flat steel tongue, $a'\,n'$, 6·2 inches long 1·1 inch broad, and 0·25 inch thick; projecting 3·25 inches on the side of the iron bar, and moving freely on conical brass pivots, rivetted into the brass and iron bars, each axis being perpendicular to the surface of the tongue, allowing it to be inclined at slightly different angles to these bars according to their expansion from, or contraction

§ 2. PLATE XVII. Description of Apparatus. Fig. 1, 2. Fig. 3. Fig. 6, 7, 8. Fig. 2, 6, 7, 8.

* The experiments here alluded to are published in the " Account of the measurement of the Loch Foyle Base."

§ 2. Description of Apparatus. Fig. 6. to, their centres. The centres of the two axes are at 0·5 inch and 2·3 inches from the end of the tongue next the brass bar. On the tongue, and flush with its upper surface, near the extremity, *n*, is inserted a silver pin, with a dot marked on it, as the compensation point.

Fig. 2, 3. The bars are placed in wooden boxes, e g f h, to the bottoms of which are fixed the plates that hold the brass rollers on which they are supported, and having in the middle a vertical brass stay, *t*, screwed on the box, and passing upwards between the two steel cylinders, *s s′*, to prevent the bars being moved longitudinally in their casing. To protect the tongue carrying the compensated point (which projects beyond the wooden box) Fig. 2. from injury, nozzles, *o o′*, are fixed to the boxes, having a small circular orifice with a lid on the upper side, to allow the dot or compensation point to be seen. On one side of the Fig. 2, 3. connecting steel cylinders, and attached to the brass bar only, is placed the longitudinal Fig. 9. level, *l*, the lid of the box being furnished with a glass window and shutter, W, to enable Fig. 2, 4. it to be observed. Over the rollers which support the bars are two pieces of metal, *m m′*, for preventing any sudden jar from striking the bars against the lid of the box. At each end, on the outside of the bar box a thick metal plate, *t*, *t*, *t*, *t*, is screwed, for the purpose PLATE XIX. Fig. 3. of firmly fixing a three-armed grooved stand, *s s′s″*, intended to support the tripod of the compensation microscope; and at each end of the box are two vane sights, *v*, (which shut down with hinges into grooves), used for placing the bars approximately in line.

Fig. 1. On both sides, at one-fourth and three-fourths of the length, are brass plates, with holes for receiving the screw which clamps the plate, C, of the tripod-stand (technically called a camel) to the box, for the purpose of adjusting the bar in a longitudinal direction. The wooden boxes are of well-seasoned straight-grained deal, selected by Sir F. Fig. 4. Knowles, F.R.S., from one of the Dockyards. The compensation bars are six in number, and designated by the letters *A*, *B*, *C*, *D*, *E*, and *G*; the weight of each bar with its two brass ends, *t*, *t*, *t*, *t*, is 136 lbs.

2. “ *Compensation Microscope.*

PLATE XVII. Fig. 3. The compensation microscope consists of three microscopes, *m n*, *c o*, *m′ n′*, placed three inches from centre to centre, connected by two bars, *a a′ b b′*, of brass and iron, 7 inches long, 0·6 inch broad, and 0·375 inch thick, 2·5 inches apart, firmly secured together by means of a brass collar and cylinder, forming part of the tube of the centre or telescopic microscope. The two bars carrying with them the outer microscopes, *m n m′n′*, of two inches focal distance, being free to expand from, and contract towards, the central microscope, *c o*, independently of each other; and thereby forming with it small angles of inclination similar to the steel tongues of the compensation bars. The compensated point of each is so adjusted as to be in the outer focus of its object-glass. Fig. 1, 2, 3. The microscopes revolve on the axis of the telescopic microscope in a tube fastened to a horizontal plate attached to a tripod-stand with levelling screws, *s s′s″*, and furnished with longitudinal and lateral adjusting screws, *h h′*. On one side, secured to the brass

bar, is the spirit level, *l*, for levelling the microscopes, and on the other, firmly fixed to the centres of the bars by a brass plate, is a telescope, *t*, embraced by a brass collar with a small cylinder projecting from one side, which turns in a socket attached to the plate; thus affording it a vertical motion, allowing objects to be seen in opposite directions. The telescopic microscope is provided with an adjusting screw, *f*, for altering the focal distance within certain limits, as well as moveable object-glasses of different focal lengths fitting into the lower end of the tube, for purposes which will be explained when the mode of proceeding in measuring the base is entered on. The compensation microscopes are seven in number, distinguished by the letters M, N, O, P, Q, R, and S; the weight of each microscope is 5 lbs. § 2. Description of Apparatus.

4. *Micrometer Microscope.*

In the event of its being necessary to remeasure any portion of the base, it became requisite to adopt means for ascertaining the value of any minute differences of length which might be observed in the first and second trials; accordingly a micrometer microscope was devised for measuring differences not varying much from six inches, consisting of a solid arm of brass, with a collar at one end and a counterpoise at the other, moving freely on a pivot, the stem of which is secured on a tripod stand; attached to the arm is a level, similar to those belonging to the compensation microscopes.

5. *Adjustments, &c.*—Compensation Bar.*

Adjustments. PLATE XVII. Fig. 2, 3.

The bar requires but one adjustment, viz: to place the longitudinal spirit level parallel to the line joining the upper surfaces of the tongues at the compensation point. This is managed with facility by removing the nozzles (the bar resting on its camels) and placing a large Y spirit level a few yards off, in such wise, that the tongues shall be exactly in focus as the telescope is pointed to each in succession, without altering its focus-screw. Next, the Y spirit level is to be rigorously adjusted, and the upper surfaces of the tongues brought to coincidence with the horizontal wire by means of the camel-screws. The lower edge of a piece of white card, resting smoothly on the tongue, forms a good mark for the wire. Lastly, the centres of the bubble and scale of the longitudinal spirit level are to be brought to coincide by means of its adjusting screws, to which the preceding arrangement is subsidiary.

Compensation Microscope.

The several adjustments of the microscopes demand much patience and nice handling. If, generally, instead of the head slit, square heads worked by keys had been given to the screws, nine-tenths of the counter pressure needed, when turning them, might have been avoided. This remark applies, in particular, to the adjustment which causes the optical axis of the side telescope to describe a plane parallel to the vertical

* The methods of adjustment here described were those pursued by me on the Zwartland Base, without reference to any collateral authority.—T. M.

§ 2. Description of Apparatus. Adjustments.

plane, passing through the optical axis of the outer microscopes,—the most liable to be deranged by casual rough handling, and upon which depends the continuation of a right line through the several compensation points (*a*).

Collimating the Telescopic Microscope.

PLATE XVIII. Fig 5.

This adjustment may be conveniently managed, the microscope resting on a bar arm, and a "point carrier" underneath it at the desired elevation. The mode of proceeding is, to a certain extent, similar to collimating the telescope of a Y spirit level, the dot on the "point carrier" affording the mark; but in the present case, the object glass is moved by the collimating screws, instead of the wire frame (*b*). The first step is to place the microscope vertical by means of the side level: the second, to rotate the microscope on its axis, and to note the deviation of the wire from the image of the dot. One half of the deviation is to be corrected by moving the object glass, the other by moving the dot on the "point carrier." The operation is to be continued by trial and error until the dot remains bisected in all positions of the outer microscopes.

Adjusting the wires of the outer Microscopes to the length of the six-inch Standard Scale.

A block of lead resting upon a strong trestle forms a good support for the 6-inch Standard Scale and the Microscope to be adjusted: a groove in the lead receives the scale over which the microscope is mounted, and levelled by means of its side level and foot screws (theodolite fashion): the standard is then to be shifted, until one of the dots defining the six inches is bisected by the wire of the outer microscope which chances to be over it: the microscope is then reversed, and if the wire bisects the other terminal dot, the adjustment for that outer microscope is correct, otherwise half of the error is to be removed by the collimating screws, *v v v v*, and the other half by moving the micros-

Fig. 1, 3. 6.

cope longitudinally, by means of the dovetail screw of the microscope stand, *h h'*. In a similar way the other outer microscope is to be adjusted. The thermometer of the 6-inch standard should be registered at the commencement and termination, and the mean taken for the temperature of the standard at the time of adjustment. No pains should be spared to effect this adjustment with rigorous accuracy.

Adjusting the Telescope to move in a vertical Plane, sensibly parallel to the vertical Plane passing through the optical axes of the outer Microscopes.

It is convenient to divide this adjustment into two steps, and to re-examine the first, for if the screws move stiffly, it may have been disturbed by the second operation. An angle of 30° may be obtained by suspending a plumb-line in front of the telescope, in such wise that its image may be seen reflected in a basin of water or mercury (the

(*a*) The microscope adjustments throughout the measurement of the Zwartland Base were made by myself, which afforded ample opportunities for estimating the weakness of this part of the arrangement.—T. M.

(*b*) It should, of course, be understood that the preliminary step in the several microscope adjustments is to place the axis upright, by means of the attached level and foot screws.

microscopes having been previously levelled): then, by means of screws *p p p*, adjust the telescope so that its vertical wire shall bisect the plumb-line and its reflected image. The *second step* consists in bringing this vertical plane into parallelism with the foci of the microscopes: for this purpose, a board about nine inches in breadth, painted black, having two white dots, whose centres are horizontally distant from each other, by twice the distance of the optical axis of the side telescope from the centre of its vertical axis, is placed upright about 60 or 70 yards off, in the line of the sight-vanes of the 6-inch standard. A similar board is set up by the same means in the opposite direction. The body of the microscope is then turned on its axis, until the scale dots appear in the middle of the narrow space between the lateral wires of the outer microscopes: next, the telescope is directed to the corresponding mark on one of the uprights, and the upright shifted until the wire bisects the mark; the telescope is then directed to the other upright, which is shifted, if necessary, until the corresponding mark upon it is bisected. The body of the microscope is now to be turned 180° in azimuth, with respect to the scale dots, and the telescope pointed to the second mark on each upright, which instantly detects if the plane described by the telescope is not parallel to the plane passing through the optical axes of the outer microscopes. The deviation, if any, is to be corrected, half by driving one and drawing the other of the two screws, which secure the telescope to the collar: the other half by the outer screws, *p p*. This result is to be considered only in the light of the first approximation.

§ 2. Description of Apparatus. Adjustments. PLATE XVIII. Fig. 2.

Fig. 2.

The microscope is now to be carefully re-levelled, and the plane described by the telescope re-examined by means of the plumb-line and its reflected image, and corrected if necessary. The line joining the dots on the standard, are to be brought to coincide correctly with the line joining the centres of the uprights, by moving the former the requisite small quantity in azimuth (or by moving the upright):—the reversion is to be repeated, and any residual deviation corrected.

Those who are familiar with the adjustment of a transit instrument, will have little difficulty in managing the one under consideration. The line from the middle point between the marks on one upright, to the corresponding point on the other upright, may be regarded as the meridian; with which the vertical plane passing through the optical axes of the outer microscopes, and the dots on the six-inch standard, must coincide. Then, with respect to the telescope, the short axis it works on should be placed horizontal, and the deviation from parallelism (regarded as an error in azimuth) should be corrected, each by means of its proper screws; the plumb-line and its reflected image guiding the former, and the marks on the uprights, the latter.

"6. *Bar Tripods or Camels, Trestles, and Triangular Frames.**

The box, containing a compensation bar, is supported at one fourth and three-fourths of its length, by means of strong brass tripods (technically called camels), with small PLATE XIX.

(* Page 22.)

§ 2. Description of Apparatus. rollers, *o o*, on the upper surface. One of the camels is provided with a tangent screw, *g*, and both with lateral screws, *f*, as well as a powerful elevating screw, *e*, wherewith
PLATE XIX. Fig. 2. to alter the height and level of the compensation points. These camels rest on strong
Fig. 1. wooden trestles, T T′, of 3″ × 2″ scantling, varying in height from 6 to 30 inches, with a framed top forming an equilateral triangle, with the angles rounded off, of 14-inch side,
Fig. 2. with a hole in the centre to allow the elevating screw, *e*, to pass through and be worked from below; the legs of the same scantling well braced together, being placed on stout
Fig. 1. triangular frames of wood, R R′, 29 in. on the side, 5″ × 3″ scantling, and supported by three wooden pickets, P P′, generally about five inches in diameter, whose length is regulated by the nature of the soil into which they are driven.

"7. *Microscope Stand* (*a*).

The tripod of the compensation microscope rests on a three-armed grooved stand, *s s′s″*,
Fig. 3. supported by a brass plate, *t t t t*, screwed to the end of the bar box. The first bar in the series has a stand attached to each end, and supports two of the microscopes; whereas each of the other bars in the series has only one microscope, and that attached to the advanced end.

"8. *Directing Theodolite* (*b*).

This is a small five-inch theodolite supported on pillars in lieu of Y's to allow it to revolve on its axis, its feet resting in grooves, on a brass plate, moved by means of a screw, in a dovetail brass frame, firmly secured to a solid piece of lead 8 in. × 7 in., and 0·6 in. thick. The movement in the dovetail is to afford the means of its being shifted transversely into line by observing the upright planks, both in front and rear of the prolongation of the base, until the inner edges coincide. The theodolite is principally used for placing the bars and microscopes approximately in line, and laying out the line of pickets.

"9. *Referring Points, or Point-carriers.*

PLATE XVII. These are of various kinds; one of the most simple consists of a solid triangular cast-
Fig. 9, 10. iron plate, Y, 15·6 inches on the side, 2·6 inches thick, with a short, flat, hollow cylinder of brass screwed on to its upper surface, enclosing a moveable disk, in which is inserted
Fig. 10. a silver pin having a dot engraved on it; this dot is adjusted to its proper position, by means of three screws passing through the cylinder, placed at equal distances on its circumference. Another sort is represented at Y′, and is formed of a cylinder of brass,
Fig. 9. which moves in a hollow cylindrical tube attached to a cast-iron slab laid on the ground, an excavation being made for the tube (*c*). The brass cylinder has at its summit an

(*a*) Page 22. (*b*) Page 23. This instrument was not used on the Zwartland Base.

(*c*) These were not used on the Zwartland Base.

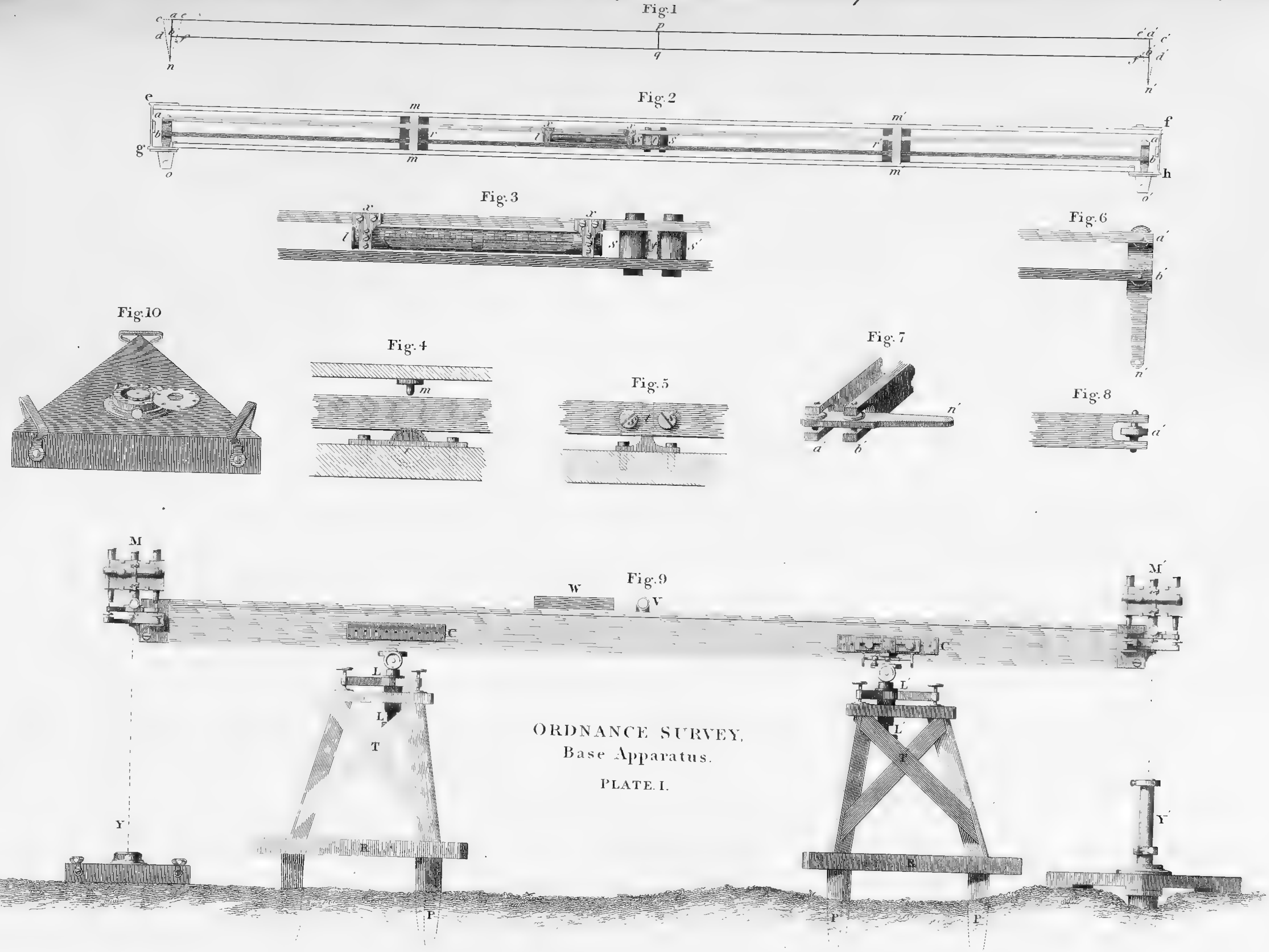


Fig. 1
Fig. 2
Fig. 3
Fig. 4
Fig. 5
Fig. 6
Fig. 7
Fig. 8
Fig. 9
Fig. 10
ORDNANCE SURVEY,
Base Apparatus.
PLATE I.

ORDNANCE SURVEY.

Base Apparatus.

PLATE.II

Fig.1

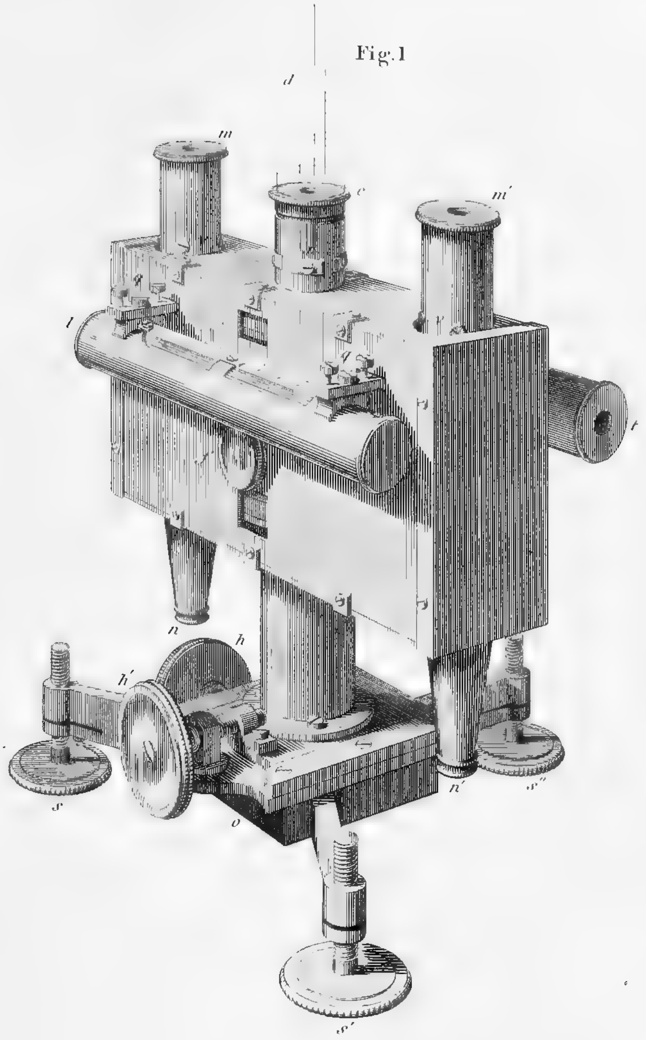


Fig.4

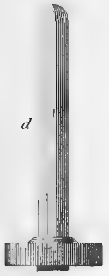


Fig.5

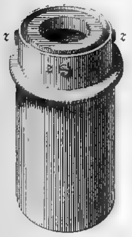


Fig.6

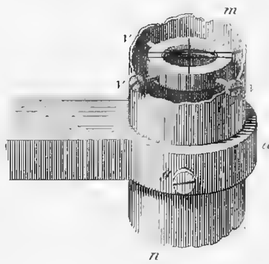


Fig.3

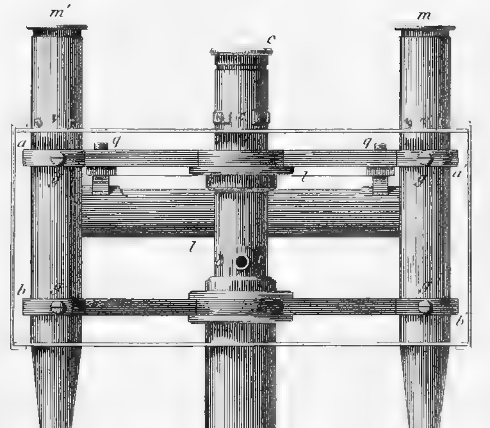
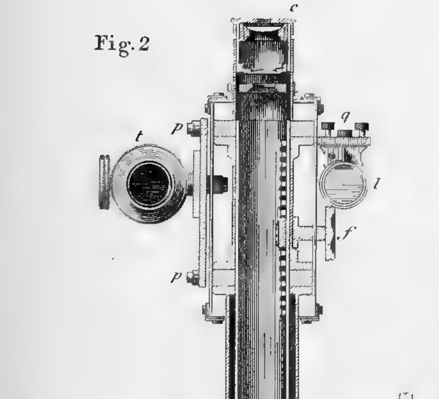


Fig.2



Verification and Extension of La Caille's Arc of Meridian.

Fig. 1

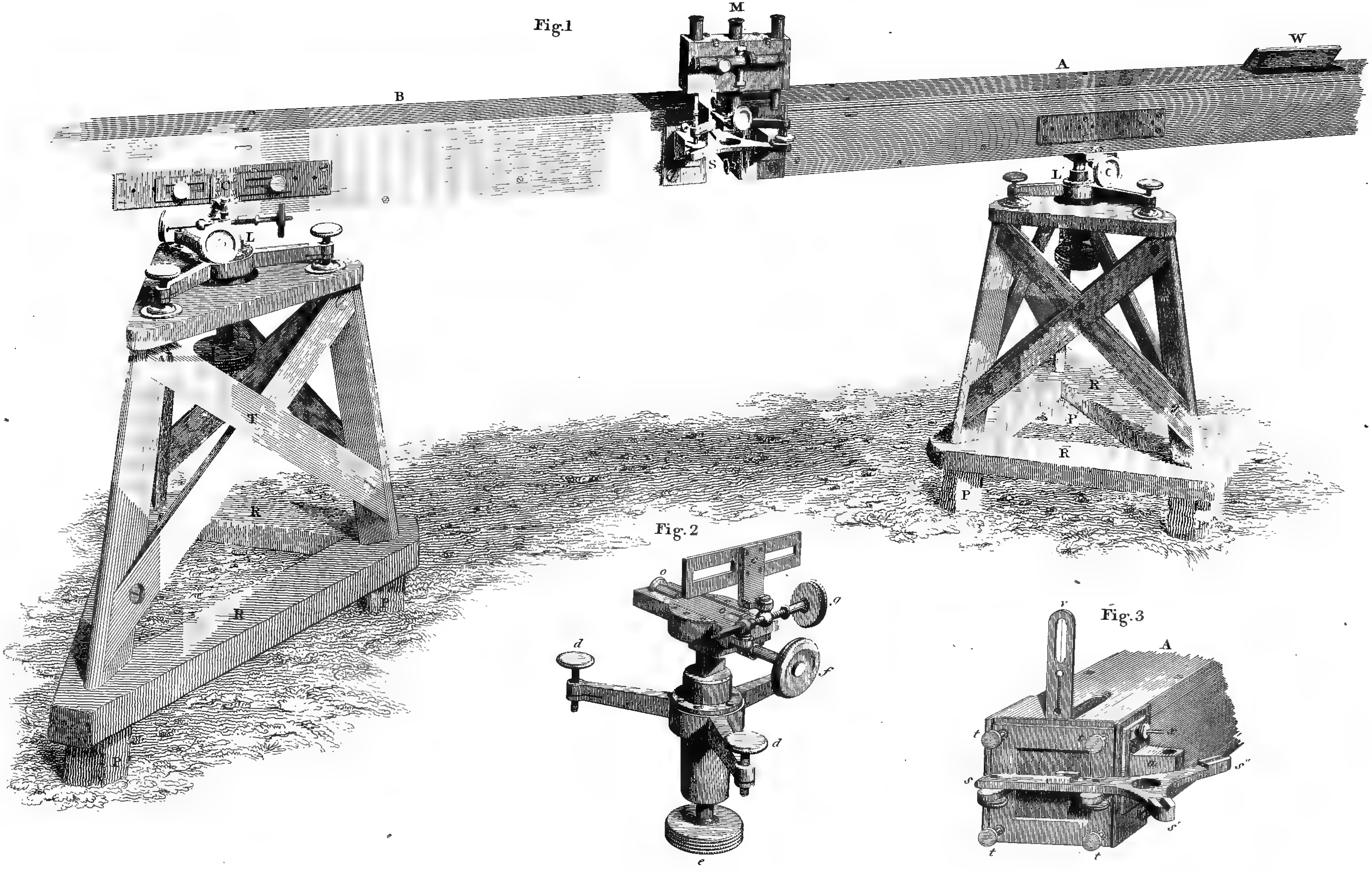
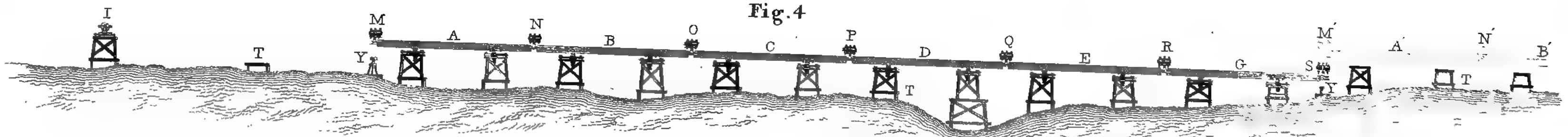


Fig. 2

Fig. 3

Fig. 4



adjustable disk similar to the former, this construction being adopted to obviate the necessity for frequently changing the object glasses of the telescopic microscope, by raising or lowering the cylinder to the proper focal distance; a clamp being provided above the cast-iron plate for fixing the brass cylinder and disk at the required height. § 2. Description of Apparatus.

"10. *Base Tents* (*a*).

The base tents are formed of wooden frames 9 feet long, 7 feet broad, 2″ × 2″ scantling, the several parts being firmly screwed together by bolts and nuts. Two of these frames are joined together at one end by strong double-jointed hinges, so as to receive a pole plate on the top, and a strong canvass covering is then laid over the double frame, the side bars of which are passed through a hem on the outer sides of the canvass, prior to the parts being bolted together. The canvass is secured to the lower bar or stretcher of the frame, by points similar to those used for the reef of sails; and as this stretcher prevents the canvass being brought close to the ground, a valance of strong, but inferior canvass, is attached to the lower part to prevent gusts of wind deranging the apparatus. These tents are constructed to shade the compensation bars and microscopes from the direct rays of the sun, and are only used on very hot and bright days; and, in order to admit of a sufficiency of light for making the bisection of the dots, &c.; the points at the bottom on one side are loosened, and the canvass run up the sides of the frame by means of the casing or hem. After the days measurement is completed, the bars are placed on skidding with all the apparatus alongside, under two of the frame tents; and to secure the whole from the weather, two triangular frames, also covered with canvass, are placed against the ends.

§ 3. Cape Standards of Measure.

§ 3. Cape Standards of Measure.

These consist of two ten-feet iron bars, marked A and B, respectively; constructed by Messrs. Troughton and Simms in the year 1838: and a six-inch brass standard, by the same artists, constructed in the year 1839.

A brass four-feet scale by Dollond, divided to inches and tenths of inches, was unfortunately bent near its middle through the negligence of the man who had temporary charge of it while shifting the camp in Zwartland.

1. *Cape ten feet Iron Standards, A and B.*

These bars being alike, a description of one will serve for both.

Bar B is of wrought iron, 122·22 inches long, 1·46 inch broad, and 2·6 inches

(*a*) Page 23.

§ 3. Cape Standards of Measure.

deep, supported at one-fourth and three-fourths of its length on brass rollers, secured to the bottom of its wooden enclosing box, and prevented from moving longitudinally by a pin attached to the box, which enters a small hole in the centre of the under surface of the bar.

At each end, about 2 inches in length and 1·3 inches in depth, are cut away, leaving surfaces which are supposed to coincide with the neutral axis of the bar: into each of these surfaces a gold pin is inserted, to carry the punctures or dots, meant to define the length of ten feet of the British Imperial standard (*a*).

A spirit level, in length about $9\frac{1}{2}$ inches, is attached to the middle of the upper surface of the bar by adjusting screws: and about half way between it and each end there is a cylindrical hole to admit the oblong bulb, one inch in length, of a delicate thermometer, bent at right angles to its stem,—which stem is fastened to the surface of the bar by mill-headed screws, to facilitate its removal, when oil or other conducting fluid is to be placed in the hole, for the purpose of connecting the temperature of the bar with the bulb.

The spirit level and thermometers are protected by hinge shutters attached to the case.

At each end, about two inches of the bar, projects through a hole in the case, for the purpose of exposing the dots to the microscopes. A brass ring surrounds the hole, to which a cylindrical brass cap screws on when the bar is not in use.

The bars are covered with stone coloured paint, except the two inches of surface in the neutral axis, where the gold pins are inserted.

2. *Six-inch Brass Standard.*

This standard is a brass bar, twelve inches nearly in length, 1·7 inch in breadth, and 0·35 inch in depth. On the lower surface, at each end, a brass plate is screwed on, of the breadth of the bar, 2·45 inches in length, and 0·25 inch thick. Hence when the bar rests upon a plane surface, 7·1 inches of its middle do not touch the bearing.

At each end, a sight-vane is fixed (by removeable mill-headed screws), for the purpose of indicating the position of a mark in the vertical of the dots, which define six inches, to facilitate the adjustment of the side telescopes of the microscopes.

A thermometer 8 inches in length, the stem bent to a right angle with the bulb, is fixed to the upper surface of the bar, the bulb being received within a hole in the bar, which hole is filled up with olive oil, or other conducting fluid while experimenting.

The length of six inches is defined by two faint punctures on silver studs; and upon the upper surface of the bar is engraved:

"Standard at 62° Faht.

"Troughton & Simms, London."

(*a*) The length will be discussed in another section.

Mr. Simms furnished the following information with the bar:— § 3. Cape Standards of Measure.

"136, Fleet-street, 20th July, 1839.

"Compared the 6-inch Standard Scale for the Cape of Good Hope, with 0 to 6 "inches upon the Standard Scale of the Royal Astronomical Society, and found the "lengths identical.

"Thermometers:

"5 feet scale,	6-inch scale,
"No. 1, 66°·5	
" „ 2, 67 ·1	66°·5.
" „ 3, 67 ·2	

"The comparison was made by laying the scales side by side, upon a plane surface, "and attaching two microscopes to a sliding frame, one over each scale.

"W. SIMMS."

§ 4. MEASUREMENT OF THE ZWARTLAND BASE.

§ 4. Measurement of Zwartland Base.

1. *Terminal Points of the Base.*

For the reasons assigned in the introductory history (§ 1) page 234, the attempt to re-measure La Caille's line, was abandoned in favour of one better suited for compensation bar measurement. The *west* terminal position of the new line is on the top of a gradual ascent, in the direction of a kloof between Klipberg and Capocberg.

The ground consists of pot-clay mixed with loose small stones. A farm-house named Koekoek Vallei, built in part with the broken up quartz rock referred to by La Caille in his journal, is distant about two-thirds of a mile to the northward *(a)*. There is no other house within a couple of miles.

A pyramidal shaped block of stone and lime masonry, rises from a depth of between three and four feet, to rather more than one foot above the surface of the ground, where the area of the block somewhat exceeds four feet square. The stones are large, and well bedded in mortar, and the upper surface is dressed so as to resemble stone flooring. A brass plug, $2\frac{1}{2}$ inches in length, hour-glass shaped, with a platinum wire driven into its centre, is fixed by lead into an iron pipe built in the centre of the block. The upper surface of the plug is smoothed off, and even with the surface of the masonry. A dot (puncture) on the platinum stud marks the terminal point.

The position of the *east* terminal point is on a swell, somewhat similar to, but more commanding than, the west. Rock, of loose texture, is found within a foot of the surface,

(a) The farm derives its name from that of a sheet of water near to which the line passes; and, in the year 1841, the occupier's name was Kotze.

§ 4. Measurement of Zwartland Base.

and becomes solid at the depth of three feet, which is about the depth of the excavation for the foundation of the masonry.

The structure for carrying the point is like that at the west end, but instead of an iron pipe in the centre, a hole is drilled in the large centre stone, for the reception of the brass plug and platinum stud which carries the terminal dot. The plug is hour-glass shaped, and is fixed in the hole with lead.

There are two farm-houses in the neighbourhood: one, at the distance of about one thousand yards in the vale to the south, was occupied, in 1841, by a Mrs. Buckle; the other, about a mile (?) to the north west, was the property, at that period, of a farmer named Basson.

After effecting the triangulation in the neighbourhood of the base, provision was made for the permanent preservation of the points, by a substantial pyramid of stone and lime masonry erected over each, ten feet square at the base and ten feet altitude,—the outside neatly dressed. A niche, at the height of six feet in the eastward face of the west pyramid, and in the westward face of the east pyramid, carries a slab of Robben Island stone, with an inscription cut in the stone. These slabs are vertical within the slant surfaces.

It is proper to record also, that the stone within each pyramid, which is immediately over the point, is hollow, so as to arch over a teakwood case laying on the point, which case contains an inscription etched on a slip of glass, and a few of the current coins of Her Majesty.

Each pyramid is encompassed by a trench and a quantity of loose stones, to prevent the approach of cattle or waggons to the structure.

2. *Alignment of the Base.*

The instruments employed were a 30-inch transit instrument, by Jones, supported on a cast-iron stand; a 20-inch transit instrument, by Dollond, supported on a cast-iron stand; and a 12-inch altitude and azimuth circle, by Dollond.

By means of the 30-inch transit, adjusted and centered over the west terminal point, normal pickets were driven at convenient intervals along the prominent ground; then along the low ground, as in the Salt River vale, by centering the same instrument over normal pickets. On each incline to this vale a pole was firmly fixed in position, because the terminal points were not visible from below. Temporary poles were then placed to guide the men in clearing the ground of bush to the width of about 20 feet.

The 12-inch theodolite was used in the early part of the measurement, for placing the uprights to guide the side telescopes of the microscopes, also for bringing the microscope *directors* into line: it was set aside afterwards in favour of the 20-inch transit instrument for these services.

The pickets, for registering lengths along the line, were in general about four feet long and four inches in diameter, hooped with iron at the upper end, and driven home

with heavy mallets: the tops were then smoothed off, and a brass pin two or three inches long and slightly serrated, was inserted to carry the dot. § 4. Alignment of the Base.

Uprights, or *struts* as they were termed on the base line, each consisting of an upright board about six inches broad, joined to a cross foot-piece, and kept at right angles to it by a brace, were erected on opposite sides of the line at normal pickets, and placed vertical by a plummet, suspended from a short projecting piece at the top: and being painted alternately black and white, their inner edges could be brought into exact line with great facility by means of the transit instrument.

Two lines of similar struts, but of less dimensions, were placed one on each side of, and parallel to the true line (the line passing through the compensation points), each distant from it, by the interval between the centre of the microscope and the optical axis of the side telescope; in other words, between the vertical plane passing through the foci of the microscopes, and the plane described by the optical axis of the side telescope,—the line to the left painted black, the other to the right painted white; and forming a lane or avenue, along the middle of which the true line ran.

The struts were distant in line from each other, according to the nature of the ground, from 200 to 250 yards. The contrast between white and black prevented mistakes when pointing the side telescope, in succession, to the inner edges right and left forward on reversing the telescope; and right and left backward to corresponding white and black marks, painted on the axis of the lining transit or theodolite.

Upon the inner edges of these struts being exactly in their respective lines, and the side telescopes correctly parallel to the foci of their microscopes, depend, whether the measured base be a measured right line or a measured zigzag.

3. *Measurement.*

The superintendent of four picket drivers, being provided with a ten feet straight edge having a spirit level fixed to it, and one of three feet similarly provided,—also with a chain having marks at the proper distances,—commences operations by laying off points for pickets in the line of measurement, at distances of 5 feet 6 inches and 5 feet alternately, these being the centres of a series of triangles of about 17 inches, placed thus: Mode of proceeding in measuring the Base.

 *direction of measurement,*—

the points indicating where the pickets are to be driven to the proposed height above the surface. The direction of the central pickets is given by the officer at the theodolite or transit telescope; their heads are levelled first, and this normal level regulates the heads of the lateral pickets. The wooden triangular frame, R (*triangles* in base line language) are then laid on the pickets, and their steadiness and level examined. The trestles, T, are next placed on the triangles, with their feet over the picket heads: next PLATE XIX. Fig. 1.

§ 4. Mode of proceeding in measuring the Base.

the camel cups and camels are placed on the trestles, and finally the compensation bars, in succession, on the camels. In the meantime the officer who works the first bar (A) stands centinel over the point-carrier, and when the bar is laid on the camels, the theodolite officer comes forward, the sight vanes are raised, and by directions from him, the bar is brought roughly into line, levelled and clamped. The sights of that bar are then lowered and those of the following raised, that it may be brought roughly into line, levelled and clamped, and so on to the end of the series.

PLATE XIX. Fig. 3.

The theodolite officer now returns to his instrument: the compensation microscopes are taken from their carrying box, and placed on the bar arms, $s\,s'\,s''$, with the points of the levelling foot screws of the tripod in the grooves. The officer at the "look down" of bar A levels his microscope, and brings the compensation dot into focus by means of the foot screws, and moves his end of the bar to bring the "look down" (central microscope) over the dot on the point-carrier: then the officer next to him adjusts the left hand microscope for level and focus, and so on to the end of the series, the several officers adjust their microscopes for level and focus.

PLATE XVIII. Fig. 1, 4.

The button of the director, *d*, is then inserted in the eye-hole of the centre or telescopic microscope, resting on the left or advanced arm of bar A, and the microscope is turned at right angles to the alignment, for the purpose of distinguishing it from the other microscopes, as seen through the theodolite telescope. The officer at the theodolite directs the telescope to the avenue between the inner edges of the line of struts, and bisects it with the middle wire,—then communicates, by signal or call, the direction, and the quantity in terms of the director, which the bar should be moved by the transverse screw of the camel, to bring the director into line. This done, the microscope is restored to the alignment, the director is placed in the eye-hole of the third microscope, which microscope is turned to right angles to the alignment, and the bar is moved by the camel screw, until the director is reported to be bisected by the theodolite wire. The same process is continued to the end of the series of microscopes.

It will be evident that the lateral movement of the advanced end of bar A into line, will carry the look down from over the point-carrier dot; both camel screws must therefore be worked simultaneously. Similarly the movement of the advanced end of bar B will carry the third microscope from over the left compensation dot of bar A; both camel screws of bar B must therefore be worked simultaneously, and so on for the other bars.

It is, of course, understood that the officer who works the director shall take care that the bars are level, that each microscope is kept correctly level, that the adjacent compensation points are in exact focus, and bisected on reversing the outer microscopes, —otherwise the final alignment, through the agency of the side telescopes, will be much impeded.

The officer who is responsible for the accuracy of the work, now re-examines the adjustments of the microscope over the point-carrier, bisects the dot on the compensation

point, and the dot on the point-carrier, then reverses the microscope to be certain that the six inches are exactly bisected; if not, he notes which side of the microscope is towards him, that the opposite side may be towards him in the following series. The distance between the foci of the outer microscopes may be correct, although, from thick oil or dirt on the axis, the reversion may not be satisfactory; but an early reference to the six-inch standard should be made when there is any doubt.

§ 4. Mode of proceeding in measuring the Base.

Another officer directs the side telescope of the second microscope forward, to the inner edge of the line of struts which is on the telescope side of the microscope,—and, if necessary, moves the bar by the transverse screw of the camel, until the telescope wire coincides with the edge of the struts,—the compensation point at the time being in the focus of the microscope. He then reverses the microscope and telescope, and directs the latter to the inner edge of the opposite line of struts. In a similar way he points, in succession, to two objects in the rear, which are in the line of the struts prolonged backward.

If the left compensation dot of bar A appears in the middle of the space between the lateral wires in the focus of the right outer microscope, and the right compensation point, also the dot on the point-carrier, are in similar position with respect to the foci of the left outer of the first microscope and look down; while, in succession, the bisecting wire of the telescope coincides with the inner edges of the double line of struts forward, and with their prolongations backward; bar A is in the true alignment, and the telescope is in adjustment.

The back marks, during the greater part of the measurement of the Zwartland base, were two rings painted on the axis of the 20-inch transit instrument,—one on each side of the telescope: that being white in the prolongation of the white line of struts, the other black; and the distance between them equal to twice the perpendicular distance of the optical axis of the side telescope, from the line joining the foci of the outer microscopes. The setting up of struts properly is a delicate and a tedious operation: those in advance have to be removed as the measurement advances; the lining theodolite, or (in the present case) lining transit, is generally centered over a point-carrier which has been left two or three series of bars behind; therefore it is exactly in the measured line.

The description which has been given of the method pursued to bring the first bar, A, into true alignment, applies to the other bars of the series, with this difference only, that the first and last bars include the consideration of the look down telescopes.

Before the termination of the side telescope alignment, the soft surface ground is paired off from beneath the advanced end of the last bar, to afford a flat firm bearing for a point-carrier (*a*). Where there is loose deep sand, a box of greater breadth than depth should be bedded in it, and nearly filled with sand to receive the point-carrier: where the ground is soft and moist, strong pickets should be driven deep for support.

The bars and microscopes having been placed truly in line, the next step is the

(*a*) Flat point-carriers, excepting one instance, were employed on the Zwartland base.

§ 4. Mode of proceeding in measuring the Base.

careful bisection of the several dots, by the transverse wires in the foci of the microscopes and look down.

The responsible officer placed at the first look down rotates his microscope, examines the side level, bisects the compensation and point-carrier dots,—the former by means of the microscope slide, the latter by means of the side camel-screw,—reverses the microscope to ascertain if the six inches are bisected, and if so he calls out "correct;" otherwise he notes the particulars. The officer at the next bar follows the same manœuvre, bisects the left compensation dot of bar A and the right of bar B, then signifies "correct." And so on to the end of the series, excepting the advanced look down. If there are not a sufficient number of officers, those at the beginning of the series move forward.

For greater security, the responsible officer now examines the several bisections, and on reaching the advanced end of the series,—the adjustments of the last microscope; then, by means of the three screws which move the disk of the point-carrier, brings the dot upon it to bisection by the wire of the look down: a box is then inverted over the point-carrier from which the series started, and a quantity of earth is strewed over the box, to screen it from the direct action of the sun. (Three point-carriers are usually left in position at the same time, as zeros for re-measurement in case of doubt.)

Each officer now carefully removes his microscope, and places it in the "carrying box" (*a*): and the responsible officer remains guarding the advanced point-carrier, while the tents and bars are being carried forward; and as it is a standing rule to keep the bars as much as possible out of sunshine, the movement is conducted accordingly. A spare set of triangles and trestles having been placed upon the advanced pickets for the next series, the tent is removed from over the commencing point-carrier of the series just measured, and placed over the advanced carrier, and picketted down,—simultaneously bar A and its camels are moved forward, laid on and covered, and the others, in succession, in the same manner.

The last point-carrier of the day is protected in the following manner. When its position becomes known, but before the adjustment of the dot, a box, some inches larger every way than the carrier, is pressed down so as to leave the trace of its edges on the ground; it is then removed, and four long iron or wooden pickets (according to the hardness of the soil) are driven at the *inner* corners of the trace, leaving five or six inches of their tops above ground. Four other wooden pickets are driven close to the trace on its *outside* at the middle of the sides, their tops also projecting a few inches.

When the dot has been adjusted, the box is pressed down over the inner and within the outer pickets, and fastened to the latter by screws passing through them. Earth is then piled over the box, and a base line tent is secured over it in the usual way for the night, or until the continuation of the measurement. But if the work is likely to be

(*a*) The microscope carrying box is provided with fitting partitions to keep them steady.

interrupted for several days, a strong register picket is driven, and a brass pin inserted to carry the dot; protected by a box, mound of earth, and tent in the way just described. § 4.

At night the bars were wrapped up in hair cloth, and placed side by side, together with the whole of the measuring apparatus, under line tents, securely fastened down.

4. *Personal Force on the Measurement of the Zwartland Base, and their duties.*

Personal Force.

The party consisted of the following :—

Thos. Maclear, H.M. Astronomer, and Responsible Superintendent.
Charles Piazzi Smyth, and } Assistants to the Astronomer, employed
William Mann, } on the work in rotation (*a*).
Captain Alexander Henderson, Royal Engineers.
Lieutenant Cust, 25th Regiment.
Serjeant John Hemming, }
Two Corporals, } Royal Sappers and Miners.
Five Privates, }
Serjeant Wm. Calderhead, }
Twelve Privates, } 25th Regiment.
Joseph Gibbs, the Carpenter attached to the Observatory.

Total: four officers, four non-commissioned officers, and eighteen men including Mr. Gibbs.

Shortly after the commencement of the operation, it was perceived that the party was not sufficiently strong. Each bar requires a qualified officer, or non-commissioned officer, for the consumption of time rests chiefly with the preliminary adjustments in lining and levelling the bars and microscopes, the details of which are partly consecutive, but chiefly simultaneous; and the only non-commissioned officer, who from talent and survey experience was qualified for a position at the bars (*b*), had charge of the stores.

Of the men, three were on the sick list at an early period, and the camp duties required in general two, the forge one, and the carpentry one; leaving about 14 or 15 for the labouring work of the measurement.

The order of the officers, with respect to their several duties and their positions at the bars, established at the beginning of the measurement was adhered to throughout; excepting where the ground was unfavourable, or trivial instances of an officer being engaged elsewhere. The order at the bars was as follows :—

Bar A, Mr. Maclear, first microscope over point-carrier.
B, Mr. Smyth or Mr. Mann.
C, Captain Henderson.
D, Lieutenant Cust,
E, Mr. Smyth or Mr. Mann.
G, Mr. Maclear, last microscope over point-carrier.

(*a*) One of the two Assistant Astronomers had, in rotation, charge of the Observatory.

(*b*) Serjeant Hemming.

Personal Force.

After the 40th set (*a*) it became necessary to dispense with bar D; then Captain Henderson did not shift from bar C, nor Lieutenant Cust from E.

Captain Henderson in general, but not always, worked the "directors" and side telescopes of the microscopes.

Mr. Maclear invariably examined the bar dot bisections after they had been declared to be correct, and managed the point-carriers. The directing theodolite, or transit, was in charge of an Assistant Astronomer.

Serjeant Calderhead superintended the picket, triangle, and trestle party, and personally levelled the picket heads. The most intelligent of the men assisted in the bar adjustments.

§ 5.

§ 5. Detail of the Measurement.

The measurement was begun at the west terminal point on the 21st of October, 1840; and on the 27th a register picket was driven, marking 1701 feet.

The precision of this length was tested, by re-commencing at the west terminal point on the 30th: on November 3rd it passed over the supposed position of La Caille's west end, and on the 4th reached the register picket before mentioned, when the wire of the "look down" telescope was seen bisecting the dot on the register pin.

On the 6th, shortly after two o'clock, while adjusting the 41st series, (*b*) the air previously calm and hot, a whirlwind suddenly sprung up, and advancing rapidly with a hissing noise, forced the tent pins (which were not well secured), and drove the tent frames against the line of bars resting on their trestles.

Bars D and E were thrown off and fell to the ground, the others were held on the camels by the parties who chanced to be near to them at the moment: the microscopes were fortunately in their carrying box.

Upon examination, and by comparison with the standard 10-feet iron bar B, it appeared that bar E had not sustained any injury; but the right hand tongue of D was bent downward about one-tenth part of an inch, and therefore disabled from taking any further share in the measurement.

While the examination of bars D and E was going on, 15 sets were measured with the four bars A, B, C, G. On the 9th bar E was restored in the 56th series, and no other accident worth recording occurred during the remainder of the operation, nor of any description whatever that could affect the precision of the measurement.

Of the retardations arising from uneven surface, or loose ground, they chiefly occurred in the sandy soil at, and in the neighbourhood of the Salt River: deep cuts had to be made in its banks, but fortunately there was little water in its bed at the time of crossing it.

A register picket was driven at the advanced end of series No. 808, on the 3rd of April, 1841; on the 5th another was driven at the advanced end of series 810,—distant

(*a*) A *series* of bars was termed a *set* of bars in the register entries, and in conversation. (*b*) Thermometer 91°·3.

31·5 feet from the intended east terminal point. These pickets and the intervening point-carrier (protected as usual by boxes and mounds of earth, and sheltered by tents) remained thus while the masonry of the terminal point was effected and became firm. On the 20th, series Nos. 809 and 810 were re-measured: the dot on the brass stud of 810 required no correction; but the dot on the point-carrier left between pickets 808 and 810 was in error 0·02 inch, the cause of which was afterwards explained. § 5.

Bars A, B, and C having been advanced to find the position of the intended terminal point, C, was removed to allow of the centre stone being drilled for the reception of the brass plug carrying the platinum stud. This done the three bars were adjusted, and a puncture made in the stud, at the distance of 31·5 feet from the 810th series.

The total length of the base, in terms of the compensation bars and microscopes in the accidental temperature during the measurement, is represented by—

Apparent length of the Base.

40	series of	63	feet	=	2520.	
15	,,	42	,,	=	630.	
754	,,	52·5	,,	=	39585.	
1	,,	52·25	,,	=	52·25,	No. 88, of Nov. 12.
1	,,	31·5	,,	=	31·5.	
			Total,	=	42818·75 feet.	

No beam compass nor measure of length, other than the compensation bars and microscopes, were used for any fraction of the distance.

Of the 158 days—between October 30, 1840, and April 5, 1841—88 were occupied wholly, or in part, measuring. The greatest length measured on any one day was 787·5 feet, effected in $11\frac{1}{2}$ hours. On these days, each series of 52·5 feet averaged 46 minutes; and this is about the maximum speed that can be attained over favourable ground with the personal force employed, paying close attention to the adjustments of the bars, &c.

Of the remaining 70 days, 12 were devoted to relaxation and private affairs at the termination of the year; 21 were Sundays; leaving 37 chargeable to shed building, camp shifting, instrumental experiments and adjustments, and unfavourable weather.

Two independent registers of the daily measurement were kept, one by Captain Henderson, the other by myself.

Tabular detail of the Measurement.

The *first* column of the following tabular detail of the measurement, gives the date.

The *second* column gives the hour and minute when each series was completed.

The *third* gives the number of the series.

The *fourth* gives the titular or identifying letter of the bar.

The *fifth* gives the same of each microscope.

The *sixth* gives the temperature of the air when each series was completed. The thermometer rested upon a bar box near the middle of the line of bars, with its bulb freely exposed to the air, but sheltered from the suns rays.

The *seventh* column gives the length of each series in terms of the bars and microscopes.

DETAIL OF THE MEASUREMENT.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.	DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1840.	h m				°	feet	1840.	h m				°	feet
Oct. 30		1	*A*	{ ½ N			Oct. 31		7	*A*	{ ½ N		
				M							M		
			B	O						*B*	O		
			C	P						*C*	P		
			D	Q						*D*	Q		
	p.m.		*E*	R				p.m.		*E*	R		
	2 45		*G*	½ S	69·2	63		1 10		*G*	½ S	73·7	63
		2	*A*	{ ½ N					8	*A*	{ ½ N		
				M							M		
			B	O						*B*	O		
			C	P						*C*	P		
			D	Q						*D*	Q		
			E	R						*E*	R		
	4 8		*G*	½ S	67·	63		2 29		*G*	½ S	73·8	63
		3	*A*	{ ½ N					9	*A*	{ ½ N		
				M							M		
			B	O						*B*	O		
			C	P						*C*	P		
			D	Q						*D*	Q		
			E	R						*E*	R		
	5 50		*G*	½ S	61·4	63		3 45		*G*	½ S	68·1	63
Oct. 31		4	*A*	{ ½ N					10	*A*	{ ½ N		
				M							M		
			B	O						*B*	O		
			C	P						*C*	P		
			D	Q						*D*	Q		
	a.m.		*E*	R						*E*	R		
	8 5		*G*	½ S	61·4	63		4 50		*G*	½ S	64·7	63
		5	*A*	{ ½ N					11	*A*	{ ½ N		
				M							M		
			B	O						*B*	O		
			C	P						*C*	P		
			D	Q						*D*	Q		
			E	R						*E*	R		
	9 25		*G*	½ S	66·5	63		5 53		*G*	½ S	62·4	63
		6	*A*	{ ½ N			Nov. 2		12	*A*	{ ½ N		
				M							M		
			B	O						*B*	O		
			C	P						*C*	P		
			D	Q						*D*	Q		
			E	R				a.m.		*E*	R		
	10 53		*G*	½ S	73·0	63		8 18		*G*	½ S	64·7	63
						(378)							(756)

The "directors" lined with the 20-inch transit instrument: C. P. Smyth worked the transit.

Order of observers: T. Maclear at half N, "look down;" C. P. Smyth at M; Capt. Henderson at O; Lieut. Cust at P; T. Maclear and Lieut. Cust at Q; C. P. Smyth at R; T. Maclear at half S, and "look down."

The thermometer rests on a bar box towards the middle of the series, with its bulb exposed; but without touching the box.

The outer microscope of half N. or of half S, which *precedes* in one series of bars, *follows* in the next; thus any inequality in the bisection of the six inches, disappears from an even number of series.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1840.	h m				°	feet
Nov. 2		13	*A*	½ N		
				M		
			B	O		
			C	P		
			D	Q		
			E	R		
	9 36		*G*	½ S	68·5	63
		14	*A*	½ N		
				M		
			B	O		
			C	P		
			D	Q		
			E	R		
	10 55		*G*	½ S	79·3	63
		15	*A*	½ N		
				M		
			B	O		
			C	P		
			D	Q		
	p.m.		*E*	R		
	0 12		*G*	½ S	83·9	63
		16	*A*	½ N		
				M		
			B	O		
			C	P		
			D	Q		
			E	R		
	1 38		*G*	½ S	82·0	63
		17	*A*	½ N		
				M		
			B	O		
			C	P		
			D	Q		
			E	R		
	2 55		*G*	½ S	80·8	63
		18	*A*	½ N		
				M		
			B	O		
			C	P		
			D	Q		
			E	R		
	4 15		*G*	½ S	78·2	63 (1134)
1840.	h m				°	feet
Nov. 2		19	*A*	½ N		
				M		
			B	O		
			C	P		
			D	Q		
			E	R		
	5 40	*	*G*	½ S	70·0	63
,, 3		20	*A*	½ N		
		*		M		
			B	O		
			C	P		
			D	Q		
	a.m.		*E*	R		
	11 46		*G*	½ S	74·2	63
		21	*A*	½ N		
				M		
			B	O		
			C	P		
			D	Q		
	p.m.		*E*	R		
	1 17		*G*	½ S	74·6	63
		22	*A*	½ N		
				M		
			B	O		
			C	P		
			D	Q		
			E	R		
	2 40	*	*G*	½ S	72·6	63
		23	*A*	½ N		
				M		
			B	O		
			C	P		
			D	Q		
			E	R		
	3 49		*G*	½ S	72·1	63
		24	*A*	½ N		
				M		
			B	O		
			C	P		
			D	Q		
			E	R		
	5 47		*G*	½ S	66·6	63 (1512)

19. The lining of G bar uncertain, owing to the lining instrument having been inadvertently removed, and no time to re-adjust.

20. The "point carrier" dot under Microscope ½ N out of line 0·7 inches—(see note to series 19); therefore placed bar A obliquely, to bring the advancing end into line. Correction = ·00033 feet subtractive.

22. Microscope S of this series supposed to be over La Caille's west end.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.	DATE.	TIME.	No. of Series	Bars.	Micro-scopes.	Therm.	Apparent Length.
1840.	h m				°	feet	1840.	h m				°	feet
Nov. 4	p.m. 1 0	25	*A* *B* *C* *D* *E* *G*	½ N M O P Q R ½ S	73·3	63	Nov. 5	p.m. 0 17	31	*A* *B* *C* *D* *E* *G*	½ N M O P Q R ½ S	81·0	63
	2 50	26	*A* *B* *C* *D* *E* *G*	½ N M O P Q R ½ S	73·3	63		1 26	32	*A* *B* *C* *D* *E* *G*	½ N M O P Q R ½ S	82·9	63
	3 55	27 *	*A* *B* *C* *D* *E* *G*	½ N M O P Q R ½ S	71·1	63		3 4	33	*A* *B* *C* *D* *E* *G*	½ N M O P Q R ½ S	78·6	63
	5 18	28	*A* *B* *C* *D* *E* *G*	½ N M O P Q R ½ S	67·3	63		4 18	34	*A* *B* *C* *D* *E* *G*	½ N M O P Q R ½ S	76·7	63
,, 5	a.m. 9 20	29	*A* *B* *C* *D* *E* *G*	½ N M O P R Q ½ S	67·7	63		5 35	35	*A* *B* *C* *D* *E* *G*	½ N M O P Q R ½ S	73·6	63
	10 35	30	*A* *B* *C* *D* *E* *G*	½ N M O P Q R ½ S	76·6 (1890)	63	,, 6	a.m. 8 15	36	*A* *B* *C* *D* *E* *G*	½ N M O P Q R ½ S	68·3	63 (2268)

25. Microscope N thrown off its arm by the tent canvas, owing to strong wind. Compared its length with that of R, by means of the adjusted bar dots; the 6 inches do not appear to be exactly bisected.

27. The "look down" wire of Microscope S bisects the dot on the register picket planted on October 27, marking 1701 feet ! !

29. By mistake Microscope R was placed on bar D, and Microscope Q on bar E.

Strong wind on the 5th.

DATE.	TIME.	No. of Series.	Bars.	Microscopes.	Therm.	Apparent Length.
1840.	h m				°	feet
Nov. 6		37	*A*	½ N M		
			B	O		
			C	P		
			D	Q		
			E	R		
	9 35		*G*	½ S	83·7	63
		38	*A*	½ N M		
			B	O		
			C	P		
			D	Q		
			E	R		
	11 5		*G*	½ S	87·8	63
		39	*A*	½ N M		
			B	O		
			C	P		
			D	Q		
	p.m.		*E*	R		
	1 10		*G*	½ S	91·4	63
		40	*A*	½ N M		
		*	*B*	O		
			C	P		
			D	Q		
			E	R		
	2 22		*G*	½ S	91·3	63 (2520)
		41	*A*	½ N M		
			B	O		
			C	R		
	3 58		*G*	½ S	84·0	42
		42	*A*	½ N M		
			B	O		
			C	R		
	4 45		*G*	½ S	82·8	42 (2604)
1840.	h m				°	feet
Nov. 6		43	*A*	½ N M		
			B	O		
	p.m.		*C*	R		
	5 55		*G*	½ S	77·8	42
„ 7		44	*A*	½ N M		
			B	O		
	a.m.		*C*	P		
	8 30		*G*	½ S	79·8	42
		45	*A*	½ N M		
			B	O		
			C	P		
	9 18		*G*	½ S	82·4	42
		46	*A*	½ N M		
			B	O		
			C	P		
	10 18		*G*	½ S	90·0	42
		47	*A*	½ N M		
			B	O		
			C	P		
	11 20		*G*	½ S	94·8	42
		48	*A*	½ N M		
			B	O		
	p m.		*C*	P		
	0 35		*G*	½ S	92·6	42
		49	*A*	½ N M		
			B	O		
			C	P		
	1 22		*G*	½ S	93·7	42
		50	*A*	½ N M		
			B	O		
			C	P		
	2 27		*G*	½ S	88·4	42 (2940)

40. After completing this series, and the bars were about to be removed from the trestles, a sudden gust of wind carried the tents against the bars: D and E were thrown off, and fell to the ground with violence. These two bars were removed to Kotze's barn to be examined, in the mean time the measurement was carried on with the other four bars. Fortunately the microscopes had been taken off.

Observers: Maclear, Smyth, Cust, Mann; Maclear for series 44, 45, 46, 47, 50, 51, 52, 53, 54, 55.
Maclear, Smyth, Mann, Henderson; Maclear for 48, 49.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1840.	h m				°	feet
Nov. 7	p.m. 3 14	51	A B C G	{½ N M} O P ½ S	86·7	42
	4 0	52 *	A B C G	{½ N M} O P ½ S	85·8	42
	4 56	53	A B C G	{½ N M} O P ½ S	82·9	42
	5 27	54	A B C G	{½ N M} O P ½ S	83·6	42
	6 15	55	A B C G	{½ N M} O P ½ S	77·1	42 (3150)
„ 9	a.m. 7 41	56 *	A B C E G	{½ N M} O P R ½ S	73·5	52·5
	9 5	57	A B C E G	{½ N M} O P R ½ S	81·1	52·5 (3255)
1840. Nov. 9	a.m. 10 6	58	A B C E G	{½ N M} O P R ½ S	87·9	52·5
	11 13	59	A B C E G	{½ N M} O P R ½ S	83·1	52·5
	p.m. 0 27	60	A B C E G	{½ N M} O P R ½ S	85·2	52·5
	1 24	61 *	A B C E G	{½ N M} O P R ½ S	82·8	52·5
	2 20	62	A B C E G	{½ N M} O P R ½ S	82·2	52·5
	3 23	63	A B C E G	{½ N M} O P R ½ S	81·9	52·5
	4 30	64 *	A B C E G	{½ N M} O P R ½ S	80·8	52·5 (3622·5)

Mr. Smyth returned to the Observatory on the 8th, and Mr. Mann took his place at the lining instrument, &c.
53. Commenced fixing the line-tents with iron pickets.
56. Bar E restored in this set. Bar D having been injured by the fall must henceforth be dispensed with.
Order of observers: Maclear, Mann, Henderson, Cust, Mann, Maclear.
61. Crossing the road from Kotze's house to his barn.
64. Clay soil as hard as sun-burned bricks. Directors lined with Dollond's repeating Theodolite

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.	DATE.	TIME.	No. of Series.	Bars	Micro-scopes.	Therm.	Apparent Length.
1840.	h m				°	feet	1840.	h m				°	feet
Nov. 9	5 36	65	*A B C E G*	½ N M O P R ½ S	76·4	52·5	Nov. 10	p.m. 1 52	72	*A B C E G*	½ N M O P R ½ S	78·0	52·5
	6 30	66	*A B C E G*	½ N M O P R ½ S	73·0	52·5		3 5	73	*A B C E G*	½ N M O P R ½ S	76·2	52·5
„ 10	a.m. 8 6	67	*A B C E G*	½ N M O P R ½ S	67·4	52·5		4 2	74	*A B C E G*	½ N M O P R ½ S	74·0	52·5
	9 17	68	*A B C E G*	½ N M O P R ½ S	74·8	52·5		5 0	75 *	*A B C E G*	½ N M O P R ½ S	64·7	52·5
	10 23	69	*A B C E G*	½ N M O P R ½ S	81·4	52·5	„ 11	a.m. 8 20	76	*A B C E G*	½ N M O P R ½ S	71·2	52·5
	11 35	70	*A B C E G*	½ N M O P R ½ S	83·8	52·5		9 15	77	*A B C E G*	½ N M O P R ½ S	73·2	52·5
	p.m. 0·53	71	*A B C E G*	½ N M O P R ½ S	76·5	52·5		10 5	78	*A B C E G*	½ N M O P R ½ S	72·8	52·5
						(3990·0)							(4357·5)

68. Microscope R does not "telescope" correctly. 75. Left off in haste, from indications of a N.W. gale.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1840.	h m				°	feet
Nov. 11	a.m. 11 27	79	*A* *B* *C* *E* *G*	½ N M O P R ½ S	74·5	52·5
	p.m. 0 19	80	*A* *B* *C* *E* *G*	½ N M O P R ½ S	76·4	52·5
	2 5	81	*A* *B* *C* *E* *G*	½ N M O P R ½ S	73·8	52·5
	3 0	82 *	*A* *B* *C* *E* *G*	½ N M O P R ½ S	73·0	52·5
	4 4	83	*A* *B* *C* *E* *G*	½ N M O P R ½ S	70·5	52·5
	5 0	84 *	*A* *B* *C* *E* *G*	½ N M O P R ½ S	68·5	52·5
	6 6	85	*A* *B* *C* *E* *G*	½ N M O P R ½ S	64·6	52·5 (4825·0)

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1840.	h m				°	feet
Nov. 12	a.m. 8 35	86	*A* *B* *C* *E* *G*	½ N M O P R ½ S	64·7	52·5
	10 3	87	*A* *B* *C* *E* *G*	½ N M O P R ½ S	78·0	52·5
	p.m. 1 0	88 *	*A* *B* *C* *E* *G*	½ N Q O ½ M R ½ S	79·0	52·5
	2 10	89	*A* *B* *C* *E* *G*	½ N M O P R ½ S	75·8	52·5
	3 5	90	*A* *B* *C* *E* *G*	½ N M O P R ½ S	73·0	52·5
	4 1	91	*A* *B* *C* *E* *G*	½ N M O P R ½ S	68·9	52·5
	4 54	92 *	*A* *B* *C* *E* *G*	½ N M O P Q ½ S	67·5	52·5 (5092·25)

82. Repeating Theodolite covered with sand raised by the wind.
84. Sandy soil near the swamp (Kotze's Valei).
86 and 87. Lieutenants Wilmot and Maclean, Royal Artillery, observed—vice Henderson.
88. A descent: Microscope Q placed on bar A vice M, and M placed on bar C, with its "look down" on bar E. Only 3 *inches of M employed.*
92. Microscope Q used on bar E instead of R, which accidentally fell, by which its telescope adjustment was disturbed.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.	DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1840.	h m				°	feet	1840.	h m				°	feet
Nov. 12	p.m. 5 51	93	*A* *B* *C* *E* *G*	½ N M O P Q ½ S	64·6	52·5	Nov. 14	a.m. 9 43	100	*A* *B* *C* *E* *G*	½ N M O P Q ½ S	85·6	52·5
„ 13	a.m. 7 45	94	*A* *B* *C* *E* *G*	½ N M O P Q ½ S	63·4	52·5		10 44	101	*A* *B* *C* *E* *G*	½ N M O P Q ½ S	92·5	52·5
	8 36	95	*A* *B* *C* *E* *G*	½ N M O P Q ½ S	71·4	52·5		11 49	102	*A* *B* *C* *E* *G*	½ N M O P Q ½ S	94·9	52·5
	9 53	96	*A* *B* *C* *E* *G*	½ N M O P R ½ S	75·2	52·5		p.m. 0 44	103	*A* *B* *C* *E* *G*	½ N M O P Q ½ S	86·7	52·5
	11 11	97	*A* *B* *C* *E* *G*	½ N M O P Q ½ S	76·1	52·5		1 46	104	*A* *B* *C* *E* *G*	½ N M O P Q ½ S	84·5	52·5
	p.m. 0 25	98 *	*A* *B* *C* *E* *G*	½ N M O P Q ½ S	75·0	52·5		3 12	105	*A* *B* *C* *E* *G*	½ N M O P Q ½ S	81·8	52·5
„ 14	8 45	99	*A* *B* *C* *E* *G*	½ N M O P Q ½ S	80·1	52·5 (5459·75)		4 15	106	*A* *B* *C* *E* *G*	½ N M O P Q ½ S	81·7	52·5 (5827·25)

98. Obliged to leave off owing to strong wind.
H. absent from 104 and the following four sets.

102. The heat oppressive.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1840.	h m				°	feet
Nov. 14		107	*A*	½ N		
				M		
			B	O		
			C	P		
	p.m.		*E*	R		
	5 19		*G*	½ S	79·9	52·5
		108	*A*	½ N		
				M		
			B	O		
			C	P		
			E	R		
	6 25		*G*	½ S	76·0	52·5
„ 16		109	*A*	½ N		
				M		
			B	O		
			C	P		
	a.m.		*E*	Q		
	7 59		*G*	½ S	66·7	52·5
		110	*A*	½ N		
				M		
			B	O		
			C	P		
			E	Q		
	9 16		*G*	½ S	77·6	52·5
		111	*A*	½ N		
				M		
			B	O		
			C	P		
			E	Q		
	10 18		*G*	½ S	82·0	52·5
		112	*A*	½ N		
				M		
			B	O		
			C	P		
			E	Q		
	11 47		*G*	½ S	85·0	52·5
		113	*A*	½ N		
		*		M		
			B	O		
			C	P		
	p.m.		*E*	Q		
	1 46		*G*	½ S	91·8	52·5
					(61	94·75)
1840.	h m				°	feet
Nov. 16		114	*A*	½ N		
				M		
			B	O		
			C	P		
	p.m.		*E*	Q		
	2 44		*G*	½ S	94·2	52·5
		115	*A*	½ N		
				M		
			B	O		
			C	P		
			E	Q		
	3 37		*G*	½ S	82·6	52·5
		116	*A*	½ N		
				M		
			B	O		
			C	P		
			E	Q		
	4 26		*G*	½ S	74·1	52·5
		117	*A*	½ N		
				M		
			B	O		
			C	P		
			E	Q		
	5 26		*G*	½ S	70·4	52·5
		118	*A*	½ N		
				M		
			B	O		
			C	P		
			E	Q		
	6 9		*G*	½ S	66·9	52·5
„ 17		119	*A*	½ N		
				M		
			B	O		
			C	P		
	a.m.		*E*	Q		
	9 22		*G*	½ S	73·4	52·5
		120	*A*	½ N		
				M		
			B	O		
			C	P		
			E	Q		
	10 20		*G*	½ S	81·1	52·5
					(65	62·25)

113. Drove a register picket at the advanced end of this series, to carry a pin with a cross marked upon it.
114. Lieut. Cust absent from this set.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.	DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1840.	h m				°	feet	1840.	h m				°	feet
Nov. 17		121	*A*	½ N, M			Nov. 20		128	*A*	½ N, M		
			B	O						*B*	O		
			C	P						*C*	P		
	a.m.		*E*	Q						*E*	Q		
	11 26		*G*	½ S	76·0	52·5		11 22		*G*	½ S	99·7	52·5
		122	*A*	½ N, M					129	*A*	½ N, M		
			B	O						*B*	O		
			C	P						*C*	P		
	p.m.		*E*	Q				p.m.		*E*	Q		
	0 41		*G*	½ S	76·7	52·5		0 40		*G*	½ S	100·1	52·5
		123	*A*	½ N, M					130	*A*	½ N, M		
			B	O						*B*	O		
			C	P						*C*	P		
			E	Q						*E*	Q		
	1 42		*G*	½ S	77·0	52·5		3 12		*G*	½ S	96·9	52·5
		124	*A*	½ N, M					131	*A*	½ N, M		
			B	O						*B*	O		
			C	P						*C*	P		
			E	Q						*E*	Q		
	2 36		*G*	½ S	74·4	52·5		4 6		*G*	½ S	93·1	52·5
		125	*A*	½ N, M					132	*A*	½ N, M		
			B	O						*B*	O		
			C	P						*C*	P		
			E	Q						*E*	Q		
	3 38		*G*	½ S	73·4	52·5		5 1		*G*	½ S	90·7	52·5
„ 20		126	*A*	½ N, M					133	*A*	½ N, M		
			B	O						*B*	O		
			C	P						*C*	P		
			E	Q						*E*	Q		
	a.m. 9 41		*G*	½ S	92·2	52·5		6 11		*G*	½ S	84·2	52·5
		127	*A*	½ N, M			„ 25		134	*A*	½ N, M		
			B	O						*B*	O		
			C	P						*C*	P		
			E	Q						*E*	Q		
	10 31		*G*	½ S	97·6	52·5		8 20		*G*	½ S	70·8	52·5
					(69	29·75)						(72	97·25)

125. Obliged to discontinue the measurement, owing to the violence of the wind: also for the same reason on the 18th and 19th. Spent the time comparing the Bars with the standard B, and adjusting microscopes.

129. The heat too oppressing to continue the measurement.

133. Barometer 29·702, thermometer 80 at 9½ p.m. A *north-wester* advancing. The *north-wester* set in on Saturday morning, 21st; Mr. Maclear seized the opportunity to visit the Observatory: returned on the 24th.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1840.	h m				°	feet
Nov. 25	9 20	135	A B C E G	½ N M O P Q ½ S	73·5	52·5
	10 13	136	A B C E G	½ N M O P Q ½ S	77·0	52·5
	11 15	137	A B C E G	½ N M O P Q ½ S	80·8	52·5
	p.m. 0 6	138	A B C E G	½ N M O P Q ½ S	83·2	52·5
	0 55	139	A B C E G	½ N M O P Q ½ S	84·7	52·5
	1 53	140	A B C E G	½ N M O P Q ½ S	77·9	52·5
	2 48	141	A B C E G	½ N M O P Q ½ S	75·5	52·5
					(76	64·75)

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1840.	h m				°	feet
Nov. 25	p.m. 3 38	142	A B C E G	½ N M O P Q ½ S	73·8	52·5
	4 30	143	A B C E G	½ N M O P Q ½ S	71·7	52·5
	5 26	144	A B C E G	½ N M O P Q ½ S	74·3	52·5
„ 26	a.m. 9 6	145	A B C E G	½ N M O P Q ½ S	68·0	52·5
	11 9	146	A B C E G	½ N M O P Q ½ S	65·5	52·5
„ 27	a.m. 7 37	147	A B C E G	½ N M O P Q ½ S	67·9	52·5
	8 42	148	A B C E G	½ N M O P Q ½ S	73·1	52·5
					(80	32·25)

146. A register picket driven at the advanced end of this series, carrying the usual brass pin with dot. The position is 52·5 feet on the east side of the Uyle Kraal road. Left off at the following series on account of rain.

Lieut. Cust absent on leave, from November 27 to December 3: unwell.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.	DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1840.	h m				°	feet	1840.	h m				°	feet
Nov. 27	a.m. 9 32	149	A B C E G	{½ N M O P Q ½ S	75·0	52·5	Nov. 27	p.m. 4 18	156	A B C E G	{½ N M O P Q ½ S	70·8	52·5
	10 37	150	A B C E G	{½ N M O P Q ½ S	77·0	52·5		5 17	157	A B C E G	{½ N M O P Q ½ S	68·0	52·5
	11 36	151	A B C E G	{½ N M O P Q ½ S	76·1	52·5	„ 28	a.m. 7 12	158	A B C E G	{½ N M O P Q ½ S	68·0	52·5
	p.m. 0 41	152	A B C E G	{½ N M O P Q ½ S	76·3	52·5		8 5	159	A B C E G	{½ N M O P Q ½ S	72·1	52·5
	1 34	153	A B C E G	{½ N M O P Q ½ S	73·2	52·5		9 0	160	A B C E G	{½ N M O P Q ½ S	70·6	52·5
	2 35	154	A B C E G	{½ N M O P Q ½ S	73·7	52·5		10 7	161	A B C E G	{½ N M O P Q ½ S	75·5	52·5
	3 27	155	A B C E G	{½ N M O P Q ½ S	71·2	52·5		11 19	162 *	A B C E G	{½ N M O P Q ½ S	76·9	52·5
					(83	99·75)						(87	67·25)

162. Removed the Azimuth circle of Dollond's Theodolite, to save the divisions from injury by sand.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.	DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1840.	h m				°	feet	1840.	h m				°	feet
Nov. 28	p.m. 0 26	163	A B C E G	{ ½ N M O P Q ½ S	79·0	52·5	Dec. 1	11 26	170	A B C E G	{ ½ M N O P R ½ S	80·4	52·5
	3 22	164	A B C E G	{ ½ N M O P Q ½ S	75·0	52·5		p.m. 0 24	171	A B C E G	{ ½ M N O P R ½ S	76·7	52·5
	4 13	165	A B C E G	{ ½ N M O P Q ½ S	75·0	52·5		3 54	172	A B C E G	{ ½ M N O P R ½ S	74·1	52·5
	5 5	166 *	A B C E G	{ ½ N M O P Q ½ S	71·0	52·5		4 44	173	A B C E G	{ ½ M N O P R ½ S	73·1	52·5
Dec. 1	a.m. 8 24	167	A B C E G	{ ½ M N O P R ½ S	68·6	52·5		5 34	174	A B C E G	{ ½ M N O P R ½ S	72·4	52·5
	9 23	168	A B C E G	{ ½ M N O P R ½ S	75·0	52·5		6 37	175	A B C E G	{ ½ M N O P R ½ S	68·4	52·5
	10 23	169	A B C E G	{ ½ M N O P R ½ S	77·0	52·5	,, 2	a.m. 7 13	176 *	A B C E G	{ ½ M N O P R ½ S	?68·2	52·5
					(91	34·75)						(95	02·25)

166. Indications of a N.W. breeze: measurement concluded in consequence. Rain came on at 7^h.

Nov. 30. Capt. Henderson and Mr. Mann comparing the compensation with the standard bar B: Mr. Maclear engaged examining and adjusting Microscopes. Microscope Q cannot *conveniently* be adjusted to bisect 6 inches on rotation, because a screw of one of the outer is broken, and the object glass is held fast with wire in consequence. Microscopes M and N will therefore change places on bar A. The levels of Microscopes Q and R are not steady: the tubes are fast in their frames. They have been frequently examined and cleaned, without discovering the cause of their unsteadiness.

The side telescopes require constant attention: they are frequently getting out of adjustment, probably from being touched when removing the Microscopes from their bearings to their carrying box.

167. Microscope R replaces Q on bar E. 170. Strong wind. 176. The Ther. not on its bar: 58 registered instead of 68?

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.	DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1840.	h m				°	feet	1840.	h m				°	feet
Dec. 2		177	*A*	{½ M, N}			Dec. 2		184	*A*	{½ M, N}		
			B	O						*B*	O		
			C	P						*C*	P		
	a.m.		*E*	R				p.m.		*E*	R		
	8 14		*G*	½ S	71·3	52·5		5 42		*G*	½ S	69·0	52·5
		178	*A*	{½ M, N}					185	*A*	{½ M, N}		
			B	O						*B*	O		
			C	P						*C*	P		
			E	R						*E*	R		
	9 10		*G*	½ S	75·1	52·5		6 30		*G*	½ S	65·0	52·5
		179	*A*	{½ M, N}			„ 3		186	*A*	{½ M, N}		
			B	O						*B*	O		
			C	P						*C*	P		
			E	R				a.m.		*E*	R		
	10 4		*G*	½ S	79·9	52·5		7 25		*G*	½ S	61·4	52·5
		180	*A*	{½ M, N}					187	*A*	{½ M, N}		
			B	O						*B*	O		
			C	P						*C*	P		
			E	R						*E*	R		
	11 12	*	*G*	½ S	83·4	52·5		8 12		*G*	½ S	65·1	52·5
		181	*A*	{½ M, N}					188	*A*	{½ M, N}		
			B	O						*B*	O		
			C	P						*C*	P		
	p.m.		*E*	R						*E*	R		
	0 14		*G*	½ S	86·7	52·5		9 39		*G*	½ S	70·4	52·5
		182	*A*	{½ M, N}					189	*A*	{½ M, N}		
			B	O						*B*	O		
			C	P						*C*	P		
			E	R						*E*	R		
	4 8		*G*	½ S	74·5	52·5		10 23		*G*	½ S	71·3	52·5
		183	*A*	{½ M, N}					190	*A*	{½ M, N}		
			B	O						*B*	O		
			C	P						*C*	P		
			E	R						*E*	R		
	5 0		*G*	½ S	70·5	52·5		11 14		*G*	½ S	73·0	52·5
					(98	69·75)						(102	37·25)

180. A register picket driven at the advanced end of this series, marking 9712·25 feet. The centre of the dot on the pin is one-third of its breadth too near the east end of the Base.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.	DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1840.	h m				°	feet	1840.	h m				°	feet
Dec. 3	p.m. 0 3	191	*A* *B* *C* *E* *G*	½ M N O P R ½ S	75·2	52·5	Dec. 4	a.m. 8 48	198	*A* *B* *C* *E* *G*	½ M N O P R ½ S	71·3	52·5
	3 19	192	*A* *B* *C* *E* *G*	½ M N O P R ½ S	77·1	52·5		9 38	199	*A* *B* *C* *E* *G*	½ M N O P R ½ S	75·5	52·5
	4 6	193	*A* *B* *C* *E* *G*	½ M N O P R ½ S	74·7	52·5		10 32	200	*A* *B* *C* *E* *G*	½ M N O P R ½ S	78·3	52·5
	5 0	194	*A* *B* *C* *E* *G*	½ M N O P R ½ S	72·1	52·5		p.m. 0 23	201	*A* *B* *C* *E* *G*	½ M N O P R ½ S	80·0	52·5
	5 56	195	*A* *B* *C* *E* *G*	½ M N O P R ½ S	68·6	52·5		1 11	202	*A* *B* *C* *E* *G*	½ M N O P R ½ S	79·8	52·5
	6 46	196	*A* *B* *C* *E* *G*	½ M N O P R ½ S	65·1	52·5		4 26	203	*A* *B* *C* *E* *G*	½ M N O P R ½ S	74·0	52·5
,, 4	a.m. 7 40	197 *	*A* *B* *C* *E* *G*	½ M N O P R ½ S	61·2	52·5 (10604·75)		5 46	204 *	*A* *B* *C* *E* *G*	½ M N O P R ½ S	69·5	52·5 (10972·25)

197. Thermometer in its box had not attained the temperature of the air.

204. Left off at 5^h 46^m to afford time for putting up struts.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.	DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1840.	h m				°	feet	1840.	h m				°	feet
Dec. 5	a.m. 7 10	205	*A B C E G*	½ M N O P R ½ S	64·5?	52·5	Dec. 5	p.m. 1 41	212	*A B C E G*	½ M N O P R ½ S	80·0	52·5
	8 2	206	*A B C E G*	½ M N O P R ½ S	72·3	52·5		2 23	213	*A B C E G*	½ M N O P R ½ S	77·7	52·5
	9 5	207	*A B C E G*	½ M N O P R ½ S	77·8	52·5		4 40	214 *	*A B C E G*	½ M N O P R ½ S	74·6	52·5
	9 55	208	*A B C E G*	½ M N O P R ½ S	77·8	52·5	„ 7	a.m. 7 55	215	*A B C E G*	½ M N O P R ½ S	72·1	52·5
	10 54	209	*A B C E G*	½ M N O P R ½ S	82·9	52·5		8 39	216	*A B C E G*	½ M N O P R ½ S	74·5	52·5
	11 49	210	*A B C E G*	½ M N O P R ½ S	81·4	52·5		10 9	217	*A B C E G*	½ M N O P R ½ S	78·9	52·5
	p.m. 0 38	211	*A B C E G*	½ M N O P R ½ S	79 6	52·5		11 17	218	*A B C E G*	½ M N O P R ½ S	80·0	52·5
					(113	39·75)						(117	07·25)

205. As yesterday: the Therm. had not been removed from its box in time to attain the temperature of the air.
214. A register picket driven at the end of this series, marking 11497·25 feet. When adjusting Microscope P in this series it did not bisect the compensation point in reversed positions: the level and side telescope were also out of adjustment, indicating the effect of a fall, though seemingly unknown to any one. Six inches were measured between the adjacent compensation points, by placing O on bar B as a test for P. P was found to rotate correctly, but the unlettered outer Microscope exceeded three inches of O, by about one-third part of the silver stud carrying the compensation point. The series was completed by re-placing P on bar C, measuring six inches by rotating the lettered end. In same way series 213 was re-measured and found correct, shewing the injury to have been sustained when removing the Microscope between series 213 and 214. P was adjusted on the six-inch standard, in the temperature 59°·4, early on the following morning.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.	DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1840.	h m				°	feet	1840.	h m				°	feet
Dec. 7	p.m. 0 24	219	A B C E G	{½ M N} O P R ½ S	80·4	52·5	Dec. 8	p.m. 1 30	226	A B C E G	{½ M N} O P R ½ S	89·2	52·5
	1 41	220	A B C E G	{½ M N} O P R ½ S	81·1	52·5		2 38	227	A B C E G	{½ M N} O P R ½ S	88·0	52·5
	3 30	221	A B C E G	{½ M N} O P R ½ S	76·5	52·5		3 55	228	A B C E G	{½ M N} O P R ½ S	86·1	52·5
,, 8	a.m. 7 58	222	A B C E G	{½ M N} O P R ½ S	71·5	52·5		5 23	229	A B C E G	{½ M N} O P R ½ S	82·0	52·5
	9 5	223	A B C E G	{½ M N} O P R ½ S	76·4	52·5		6 35	230	A B C E G	{½ M N} O P R ½ S	76·2	52·5
	10 36	224	A B C E G	{½ M N} O P R ½ S	84·1	52·5	,, 10	a.m. 7 38	231	A B C E G	{½ M N} O P R ½ S	68·0	52·5
	11 59	225	A B C E G	{½ M N} O P R ½ S	90·0	52·5		10 15	232	A B C E G	{½ M N} O P R ½ S	72·0	52·5
					(120	74·75)						(124	42·25)

220. Captain Henderson otherwise engaged.

221. Obliged to leave off owing to the violence of the south wind. Microscope P was again found this morning out of order. The lettered half only used.

Strong wind on the 8th. December 9 devoted to planting directing pickets in the low ground near the Salt River, and to the examination of Microscopes.

The dot on the six-inch brass scale near the Thermometer bulb is 17 divisions of the Micrometer Microscope belonging to the bar apparatus, designed for measuring small quantities. $12^{r}\cdot253$ of the Micrometer screw = 0·1 inch of the four feet brass scale, in temperature 76; ∴ 17 divisions = $0^{in}\cdot0013874$ = the diameter of the dot. The temperature of the six-inch brass standard rose from 88 to 100°, which afforded an estimate of the compensation of the Bar Micros-

DATE.	TIME.	No. of Series.	Bars.	Microscopes.	Therm.	Apparent Length.	DATE.	TIME.	No. of Series.	Bars.	Microscopes.	Therm.	Apparent Length.
1840.	h m				°	feet	1840.	h m				°	feet
Dec. 10	a.m. 11 40	233	A B C E G	½ M N O Q R ½ S	76·4	52·5	Dec. 11	a.m. 11 0	240	A B C E G	½ M N O Q R ½ S	87·2	52·5
	p.m. 0 34	234	A B C E G	½ M N O Q R ½ S	74·5	52·5		11 49	241 *	A B C E G	½ M N O Q R ½ S	88·4	52·5
	1 42	235	A B C E G	½ M N O Q R ½ S	84·3	52·5		p.m. 0 34	242	A B C E G	½ M N O Q R ½ S	83·8	52·5
	3 6	236	A B C E G	½ M N O Q R ½ S	80·0	52·5		1 28	243	A B C E G	½ M N O Q R ½ S	82·3	52·5
„ 11	a.m. 8 12	237	A B C E G	½ M N O Q R ½ S	73·8	52·5		2 23	244	A B C E G	½ M N O Q R ½ S	81·9	52·5
	9 19	238	A B C E G	½ M N O Q R ½ S	84·4	52·5		3 35	245	A B C E G	½ M N O Q R ½ S	81·5	52·5
	10 3	239 *	A B C E G	½ M N O Q R ½ S	88·5	52·5		4 20	246	A B C E G	½ M N O Q R ½ S	81·3	52·5
					(128	09.75)						(131	77·25)

copes by comparing the wire on one side with the dot, while the wire of the other outer Microscope bisected the opposite dot. Taking the expansion of brass at ·000009959 for one degree = ·000059754 for 6 inches, and for 23°·0013743, &c. Subtracting the temperatures when the Microscopes were adjusted on the 30th of November from the temperatures of to-day while experimenting, the computed value in terms of the dot for the difference was compared with the observed displacement, and as far as the eye could detect they exactly agreed; implying that the wires remained firm and the Microscopes unaffected by changes of temperature. The method is rough, but sufficient for the object in view. The side telescopes were next examined, and slight deviations from adjustment corrected, excepting P, which will be replaced by Q on the present work.

239. The plumb-line dropped on the point-carrier brass plate. 241. R seems to be out of adjustment.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.	DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1840.	h m				°	feet	1840.	h m				°	feet
Dec. 11	p.m. 5 13	247	A B C E G	½ M N O Q R ½ S	80·5	52·5	Dec. 14	a.m. 11 55	254	A B C E G	½ M N O Q R ½ S	74·0	52·5
	5 54	248	A B C E G	½ M N O Q R ½ S	80·5	52·5		p.m. 1 22	255 *	A B C E G	½ M N O Q R ½ S	74·1	52·5
	6 41	249 *	A B C E G	½ M N O Q R ½ S	75·5	52·5		3 0	256	A B C E G	½ M N O Q R ½ S	74·5	52·5
„ 12	a.m. 8 11	250 *	A B C E G	½ M N O Q R ½ S	64·9	52·5		3 56	257	A B C E G	½ M N O Q R ½ S	71·9	52·5
„ 14	9 17	251	A B C E G	½ M N O Q R ½ S	71·5	52·5		4 58	258	A B C E G	½ M N O Q R ½ S	67·8	52·5
	10 5	252	A B C E G	½ M N O Q R ½ S	73·0	52·5	„ 15	7 44	259	A B C E G	½ M N O Q R ½ S	73·0	52·5
	11 8	253	A B C E G	½ M N O Q R ½ S	74·5 (135	52·5 44·75)		8 35	260 *	A B C E G	½ M N O Q R ½ S	79·2 (139	52·5 12·25)

249. Microscope Q was carefully cleaned on the evening of the 11th, and the edge of the plate of the brass case that touched the outside of the stem was filed away: this done the instrument rotated correctly.

250. While measuring set 251, one of the party engaged in placing the "point-carrier," accidentally hit Microscope S with his head and it fell to the ground. The side telescope was thrown out of adjustment, and the measurement was therefore stopped. The adjustment for length was made the same evening in temperature 66°: also the case of O was removed, the collar and axis cleaned, and the brass of the case, where it pressed on the axis, was filed away.

December 14. Commenced by re-measuring series 250.

255. A rather abrupt ascent: the Bars placed on the triangles without tressels.

258. Indications of the approach of "a north-wester" with rain. 260. Measuring over a spongy mound of sand.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1840.	h m				°	feet
Dec. 15		261	*A* *B* *C* *E* *G*	{½ M, N O Q R ½ S		
	a.m. 9 38				79·9	52·5
		262	*A* *B* *C* *E* *G*	{½ M, N O Q R ½ S		
	10 52				81·8	52·5
		263	*A* *B* *C* *E* *G*	{½ M, N O Q R ½ S		
	0 0				80·5	52·5
„ 17		264	*A* *B* *C* *E* *G*	{½ M, N O Q R ½ S		
	a.m. 7 46				82·2	52·5
		265	*A* *B* *C* *E* *G*	{½ M, N O Q R ½ S		
	8 31				84·9	52·5
		266	*A* *B* *C* *E* *G*	{½ M, N O Q R ½ S		
	9 24				91·4	52·5
		267	*A* *B* *C* *E* *G*	{½ M, N O Q R ½ S		
	10 17				94·8	52·5
					(142	79·75)
1840.	h m				°	feet
Dec. 17		268	*A* *B* *C* *E* *G*	{½ M, N O Q R ½ S		
	a.m. 11 21				100·5	52·5
		269	*A* *B* *C* *E* *G*	{½ M, N O Q R ½ S		
	p.m. 0 25				98·0	52·5
		270	*A* *B* *C* *E* *G*	{½ M, N O Q R ½ S		
	1 27				97·6	52·5
		271	*A* *B* *C* *E* *G*	{½ M, N O Q R ½ S		
	2 40				95·3	52·5
		272	*A* *B* *C* *E* *G*	{½ M, N O Q R ½ S		
	3 55				92·4	52·5
		273	*A* *B* *C* *E* *G*	{½ M, N O Q R ½ S		
	4 42				91·0	52·5
		274	*A* *B* *C* *E* *G*	{½ M, N O Q R ½ S		
	6 54				77·5	52·5
					(146	47·25)

263. Stopped measuring for the purpose of comparing the Compensation-bars with the standard B, by means of the Microscopic beam compass lately constructed.

December 16. The day distressingly hot: it was in part spent comparing bars.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1840.	h m				°	feet
Dec. 18	a.m. 7 6	275	A B C E G	½ M N O Q R ½ S	63·1	52·5
	8 25	276	A B C E G	½ M N O Q R ½ S	77·8	52·5
	9 23	277	A B C E G	½ M N O Q R ½ S	75·1	52·5
	p.m. 0 35	278 *	A B C E G	½ M N O Q R ½ S	88·6	52·5
	1 35	279	A B C E G	½ M N O Q R ½ S	81·1	52·5
	2 45	280	A B C E G	½ M N O Q R ½ S	80·8	52·5
	3 45	281	A B C E G	½ M N O Q R ½ S	79·7	52·5
					(150	14·75)
1840.	h m				°	feet
Dec. 18	p.m. 4 44	282	A B C E G	½ M N O Q R ½ S	78·0	52·5
	6 15	283 *	A B C E G	½ M N O Q R ½ S	68·5	52·5
,, 21	a.m. 7 35	284	A B C E G	½ M N O Q R ½ S	70·4	52·5
	8 46	285	A B C E G	½ M N O Q R ½ S	78·4	52·5
	10 13	286	A B C E G	½ M N O Q R ½ S	86·5	52·5
	11 22	287	A B C E G	½ M N O Q R ½ S	93·0	52·5
	p.m. 1 14	288	A B C E G	½ M N O Q R ½ S	93·5	52·5
					(153	32·25)

278. At the advanced end of this series a register picket was driven, marking 14857·25 apparent feet. An oblong dot inadvertently made on the pin. The true position of the "look down" wire, one-third of the diameter of the dot towards the east of its centre.

283. Drove a strong register picket at the advanced end of this series, marking 15119·75 feet; for reference, if necessary, while measuring over the soft ground near the river. The dot is rather oblong, but its centre is the correct point.

284. Strong south wind.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1840.	h m				°	feet
Dec. 21	p.m. 2 53	289	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	90·2	52·5
„ 22	a.m. 9 46	290	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	82·7	52·5
	11 12	291 *	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	88·0	52·5
	p.m. 0 17	292	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	83·4	52·5
	1 19	293	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	85·3	52·5
	3 12	294	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	77·1	52·5
	4 32	295 *	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	71·7	52·5
					(157	49·75)
1840.	h m				°	feet
Dec. 22	p.m. 6 18	296 *	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	65·0	52·5
1841. Jan. 6	p.m. 1 8	297	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	73·8	52·5
	2 42	298	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	71·3	52·5
	4 17	299	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	68·9	52·5
	5 42	300	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	65·4	52·5
„ 8	a.m. 7 35	301 *	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	66·6	52·5
	9 21	302	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	81·4	52·5
					(161	17·25)

291. Passing along the south side of a pool of water, one of the lagoons of the Salt River. This locality is the worst part of the line, and swampy in the winter season. La Caille does not mention the place.

295. Difficult work, the tents generally obstructing a view of the lining struts from the Theodolite, owing to the unevenness of the ground.

296. Drove a register picket at the end of this set, marking 15802·25 feet. Two dots on the pin, corresponding to the wire in reversed positions, viz.: separated by double of the error in collimation. The middle of the interval is the true point.

January 6, series 297. Engaged in the forenoon comparing Bars, and in making deep cuts for the Bars in the banks of the Salt River. Progress retarded by the nature of the ground, and by showers of sand raised by brisk wind.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.	DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet	1841.	h m				°	feet
Jan. 8	a.m. 11 15	303	*A B C E G*	{½ M N O Q R ½ S	94·5	52·5	Jan. 9	a.m. 8 12	310	*A B C E G*	{½ M N O Q R ½ S	68·5	52·5
	p.m. 0 48	304	*A B C E G*	{½ M N O Q R ½ S	95·1	52·5		9 7	311	*A B C E G*	{½ M N O Q R ½ S	71·4	52·5
	2 19	305 *	*A B C E G*	{½ M N O Q R ½ S	* 103·0	52·5		10 12	312	*A B C E G*	{½ M N O Q R ½ S	73·1	52·5
	3 48	306	*A B C E G*	{½ M N O Q R ½ S	90·7	52·5		11 4	313	*A B C E G*	{½ M N O Q R ½ S	74·8	52·5
	5 3	307	*A B C E G*	{½ M N O Q R ½ S	88·2	52·5		p.m. 0 3	314	*A B C E G*	{½ M N O Q R ½ S	77·2	52·5
	6 15	308	*A B C E G*	{½ M N O Q R ½ S	85·7	52·5		0 53	315	*A B C E G*	{½ M N O Q R ½ S	78·8	52·5
„ 9	a.m. 7 19	309	*A B C E G*	{½ M N O Q R ½ S	66·3	52·5		2 4	316	*A B C E G*	{½ M N O Q R ½ S	80·2	52·5
					(164	84·75)						(168	52·25)

Mr. C. P. Smyth has replaced Mr. Mann, the former taking charge of the Royal Observatory.

300. This set crossed the Salt River at its mean bend.

January 7. Engaged with Captain Henderson and Mr. Smyth clearing the nozzles of sand: cleaning clamps, camels, microscopes, &c. The men were employed cutting through the sand banks on the east side of the Salt River.

305. Thermometer bulb not properly exposed: the temperature of the air was about 95°.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet
Jan. 9	p.m. 3 15	317 *	*A B C E G*	½ M N O Q R ½ S	76·9	52·5
„ 11	a.m. 8 59	318	*A B C E G*	½ M N O Q R ½ S	75·8	52·5
	p.m. 0 3	319	*A B C E G*	½ M N O Q R ½ S	89·7	52·5
	1 59	320	*A B C E G*	½ M N O Q R ½ S	83·4	52·5
„ 12	a.m. 8 50	321	*A B C E G*	½ M N O Q R ½ S	81·3	52·5
	10 18	322	*A B C E G*	½ M N O Q R ½ S	81·7	52·5
	11 27	323	*A B C E G*	½ M N O Q R ½ S	84·9	52·5
					(172	19·75)

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet
Jan. 12	p m. 0 46	324	*A B C E G*	½ M N O Q R ½ S	81·2	52·5
	2 0	325 *	*A B C E G*	½ M N O Q R ½ S	82·0	52·5
„ 14	a.m. 8 25	326	*A B C E G*	½ M N O Q R ½ S	78·9	52·5
	9 46	327	*A B C E G*	½ M N O Q R ½ S	90·8	52·5
	11 0	328	*A B C E G*	½ M N O Q R ½ S	94·7	52·5
	p.m. 0 15	329 *	*A B C E G*	½ M N O Q R ½ S	88·3	52·5
	1 17	330	*A B C E G*	½ M N O Q R ½ S	86·0	52·5
					(175	87·25)

317. Left off to compare Bars.

January 11, at 10h 20m a.m., a sudden gust of wind drove the tent against Bar A, which was falling off the trestles, but Mr. Maclear being at Microscope M, over the "point-carrier," held up that end of the Bar, though he could not prevent the left end and Microscope N from reaching the ground: neither sustained any injury. The accident arose from neglecting to secure the guy and foot ropes to the pickets, a common practice in calm weather, but which cannot be too strongly reprobated. The former accident led to a general order on this subject, and the present shews how necessary, in addition, is personal superintendence.

January 12. The measurement delayed by the examination of Microscopes. N was found correct in temperature 66°·5 and M in 62°·0.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.	DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet	1841.	h m				°	feet
Jan. 14	p.m. 3 11	331	*A B C E G*	½ M N O Q R ½ S	82·4	52·5	Jan. 16	11 54	338	*A B C E G*	½ M N O Q R ½ S	90·7	52·5
	4 11	332	*A B C E G*	½ M N O Q R ½ S	78·2	52·5		p.m. 0 52	339	*A B C E G*	½ M N O Q R ½ S	93·3	52·5
	5 5	333 *	*A B C E G*	½ M N O Q R ½ S	75·1	52·5		2 11	340 *	*A B C E G*	½ M N O Q R ½ S	92·3	52·5
„ 16	a.m. 7 53	334 *	*A B C E G*	½ M N O Q R ½ S	79·2	52·5		3 12	341	*A B C E G*	½ M N O Q R ½ S	88·1	52·5
	8 55	335	*A B C E G*	½ M N O Q R ½ S	85·6	52·5		4 23	342 *	*A B C E G*	½ M N O Q R ½ S	84·4	52·5
	9 56	336	*A B C E G*	½ M N O Q R ½ S	88·3	52·5	„ 18	a.m. 7 33	343	*A B C E G*	½ M N O Q R ½ S	81·4	52·5
	10 44	337	*A B C E G*	½ M N O Q R ½ S	88·0	52·5		8 25	344	*A B C E G*	½ M N O Q R ½ S	87·6	52·5
					(179	54·75)						(183	22·25)

325. The wind rising and the ground loose sand, the measurement was stopped, and the men set to work on a place in advance for comparing Bars.
329. The tent-frames are becoming rickety from constant shifting.
333. Left off for the purpose of planting uprights (struts). Strong wind in gusts.
334. Drove a strong register picket at the advanced end of this series, marking 17797·25 feet. Two dots were made on the pin, corresponding to the reversed positions of the wire; the middle of the space between them is the correct point.
240. Sudden puffs of wind from the south. Difficult to drive pickets, as the rock is close to the surface.
342. Left off measuring from being too close to the picket drivers, and the wind dangerously strong.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet
Jan. 18	a.m. 9 56	345 *	A B C E G	½ M N O Q R ½ S	90·7	52·5
„ 19	a.m. 8 3	346 *	A B C E G	½ M N O Q R ½ S	93·6	52·5
	9 21	347	A B C E G	½ M N O Q R ½ S	97·6	52·5
	11 16	348	A B C E G	½ M N O Q R ½ S	96·2	52·5
	p.m. 0 11	349 *	A B C E G	½ M N O Q R ½ S	96·2	52·5
	1 2	350	A B C E G	½ M N O Q R ½ S	94·4	52·5
	1 56	351	A B C E G	½ M N O Q R ½ S	94·8	52·5
					(186	89·75)
1841.	h m				°	feet
Jan. 19	p.m. 2 52	352	A B C E G	½ M N O Q R ½ S	101·7	52·5
	3 54	353	A B C E G	½ M N O Q R ½ S	98·9	52·5
	4 49	354	A B C E G	½ M N O Q R ½ S	93·7	52·5
	5 45	355	A B C E G	½ M N O Q R ½ S	86·7	52·5
	6 30	356	A B C E G	½ M N O Q R ½ S	84·9	52·5
	7 15	357 *	A B C E G	½ M N O Q R ½ S	81·4	52·5
„ 21	a.m. 9 0	358	A B C E G	½ M N O Q R ½ S	81·9	52·5
					(190	57·25)

345. Left off measuring, because the wind is dangerously strong.
946. Found the level tube of Microscope O broken, replaced it by the level belonging to Microscope P.
January 19. Judge Menzies, Mr. Stuart, the High Sheriff, and several gentlemen visited the camp this day to witness the nature of the operation.
349. The Thermometer was registered 86°·2, which must be in error 10°: the numbers have been altered accordingly.
357. There was little light when closing this series, and the dots were consequently not distinct: it will therefore be re-measured. This days work seemed to overpower the party.
January 20. Thunder and rain towards the middle of the day. Compared Bars early in the morning, and when the rain came on, compared the Microscopes with the 6-inch standard.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.	DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet	1841.	h m				°	feet
Jan. 21		359	*A*	½ M, N			Jan. 21		366	*A*	½ M, N		
			B	O						*B*	O		
			C	Q						*C*	Q		
			E	R						*E*	R		
	a.m. 9 55		*G*	½ S	86·0	52·5		p.m. 5 50		*G*	½ S	79·6	52·5
		360	*A*	½ M, N			,, 22		367	*A*	½ M, N		
			B	O						*B*	O		
			C	Q						*C*	Q		
			E	R						*E*	R		
	10 51		*G*	½ S	89·7	52·5		a.m. 7 12		*G*	½ S	77·3	52·5
		361	*A*	½ M, N					368	*A*	½ M, N		
			B	O						*B*	O		
			C	Q						*C*	Q		
			E	R						*E*	R		
	11 57		*G*	½ S	91·2	52·5		8 42		*G*	½ S	88·6	52·5
		362	*A*	½ M, N					369	*A*	½ M, N		
			B	O						*B*	O		
			C	Q						*C*	Q		
			E	R						*E*	R		
	p.m. 1 5		*G*	½ S	89·4	52·5		10 17		*G*	½ S	90·6	52·5
		363	*A*	½ M, N					370	*A*	½ M, N		
			B	O						*B*	O		
			C	Q						*C*	Q		
			E	R						*E*	R		
	2 13		*G*	½ S	88·1	52·5		p.m. 0 9		*G*	½ S	93·2	52·5
		364	*A*	½ M, N					371	*A*	½ M, N		
			B	O						*B*	O		
			C	Q						*C*	Q		
			E	R						*E*	R		
	3 19		*G*	½ S	86·9	52·5		1 10		*G*	½ S	90·2	52·5
		365	*A*	½ M, N					372	*A*	½ M, N		
			B	O						*B*	O		
			C	Q						*C*	Q		
			E	R						*E*	R		
	4 28		*G*	½ S	84·8	52·5		2 30		*G*	½ S	88·3	52·5
					(194	24·75)						(197	92·25)

361. The surface of the rock is only a few inches below the surface of the ground.
372. West end of G Bar over a road from Coggera to Uyle Kraal.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.	DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet	1841.	h m				°	feet
Jan. 22	p.m. 3 38	373	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	89·3	52·5	Jan. 23	p.m. 0 40	380	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	80·6	52·5
	4 43	374	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	87·2	52·5		1 45	381	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	79·8	52·5
„ 23	a.m. 7 56	375	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	79·2	52·5		2 31	382	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	77·2	52·5
	9 7	376	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	83·0	52·5		3 23	383	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	76·3	52·5
	10 10	377	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	83·9	52·5		4 6	384	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	73·8	52·5
	11 2	378	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	83·8	52·5		5 3	385	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	71·7	52·5
	11 54	379	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	83·0	52·5	„ 25	a.m. 8 47	386	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	71·6	52·5
					(201	59·75)						(205	27·25)

374. Left off to compare bars.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.	DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet	1841.	h m				°	feet
Jan. 25		387	*A*	½ M, N			Jan. 25		394	*A*	½ M, N		
			B	O						*B*	O		
			C	Q						*C*	Q		
	a.m.		*E*	R				p.m.		*E*	R		
	9 42		*G*	½ S	73·3	52·5		4 59		*G*	½ S	72·4	52·5
		388	*A*	½ M, N					395	*A*	½ M, N		
			B	O						*B*	O		
			C	Q						*C*	Q		
			E	R						*E*	R		
	10 44		*G*	½ S	76·3	52·5		6 1		*G*	½ S	70·3	52·5
		389	*A*	½ M, N			„ 26		396	*A*	½ M, N		
			B	O						*B*	O		
			C	Q						*C*	Q		
			E	R				a.m.		*E*	R		
	11 54		*G*	½ S	79·0	52·5		9 19		*G*	½ S	77·6	52·5
		390	*A*	½ M, N					397	*A*	½ M, N		
			B	O						*B*	O		
			C	Q						*C*	Q		
	p.m.		*E*	R						*E*	R		
	1 4		*G*	½ S	80·3	52·5		10 13		*G*	½ S	80·3	52·5
		391	*A*	½ M, N					398	*A*	½ M, N		
			B	O						*B*	O		
			C	Q						*C*	Q		
			E	R						*E*	R		
	1 58		*G*	½ S	78·9	52·5		11 2		*G*	½ S	81·3	52·5
		392	*A*	½ M, N					399	*A*	½ M, N		
			B	O						*B*	O		
			C	Q						*C*	Q		
			E	R						*E*	R		
	2 53		*G*	½ S	77·3	52·5		11 58		*G*	½ S	82·8	52·5
		393	*A*	½ M, N					400	*A*	½ M, N		
			B	O						*B*	O		
			C	Q						*C*	Q		
			E	R				p.m.		*E*	R		
	3 57		*G*	½ S	76·5	52·5		0 47		*G*	½ S	84·2	52·5
					(208	94·75)						(212	62·25)

DATE.	TIME.	No. of Series.	Bars.	Microscopes.	Therm.	Apparent Length.
1841.	h m				°	feet
Jan. 26	p.m. 1 42	401	A B C E G	½ M N O Q R ½ S	83·2	52·5
	3 18	402 *	A B C E G	½ M N O Q R ½ S	80·6	52·5
Feb. 1	a.m. 9 13	403 *	A B C E G	½ M N O Q R ½ S	87·0	52·5
	10 12	404	A B C E G	½ M N O Q R ½ S	91·6	52·5
	11 5	405	A B C E G	½ M N O Q R ½ S	94·2	52·5
	p.m. 0 1	406	A B C E G	½ M N O Q R ½ S	89·6	52·5
	2 17	407 *	A B C E G	½ M N O Q R ½ S	85·4	52·5
					(216	29·75)
1841.	h m				°	feet
Feb. 1	p.m. 3 15	408	A B C E G	½ M N O Q R ½ S	83·5	52·5
	4 21	409	A B C E G	½ M N O Q R ½ S	82·7	52·5
	5 24	410	A B C E G	½ M N O Q R ½ S	75·7	52·5
	6 31	411	A B C E G	½ M N O Q R ½ S	69·8	52·5
„ 2	a.m. 7 31	412	A B C E G	½ M N O Q R ½ S	73·1	52·5
	8 25	413	A B C E G	½ M N O Q R ½ S	73·8	52·5
	10 37	414	A B C E G	½ M N O Q R ½ S	85·4	52·5
					(219	97·25)

402. Drove a strong register picket at the advanced end of this series, marking 21367·25 feet: the centre of the puncture on the brass pin—the true point.

The moving of the camp forward, and clearing more ground, occupied January 27, 28, 29, and 30. The opportunity was taken to make several sets of comparisons, and to examine Microscopes. The Microscopes were adjusted in the accidental temperature of the six-inch brass standard.

403. The Thermometer may be in error 1°.

407. Detained by a side screw having been forced, and the threads crossed.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.	DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet	1841.	h m				°	feet
Feb. 2	a.m. 11 48	415 *	A B C E G	½ M N O Q R ½ S	86·8	52·5	Feb. 3	a.m. 6 56	422 *	A B C E G	½ M N O Q R ½ S	70·1	52·5
	p.m. 0 40	416	A B C E G	½ M N O Q R ½ S	86·9	52·5		8 17	423	A B C E G	½ M N O Q R ½ S	77·2	52·5
	1 42	417	A B C E G	½ M N O Q R ½ S	87·1	52·5		9 57	424	A B C E G	½ M N O Q R ½ S	81·4	52·5
	2 45	418	A B C E G	½ M N O Q R ½ S	85·7	52·5		11 21	425	A B C E G	½ M N O Q R ½ S	85·7	52·5
	3 46	419	A B C E G	½ M N O Q R ½ S	84·9	52·5		p.m. 0 45	426	A B C E G	½ M N O Q R ½ S	84·6	52·5
	4 51	420	A B C E G	½ M N O Q R ½ S	78·2	52·5		2 17	427	A B C E G	½ M N O Q R ½ S	84·8	52·5
	6 14	421	A B C E G	½ M N O Q R ½ S	72·7	52·5	,, 5	a.m. 6 54	428 *	A B C E G	½ M N O Q R ½ S	68·0	52·5
					(223	64·75)						(227	32·25)

415. Whirlwind gusts from the south: partial as to locality, and rarely exceeding 100 yards in diameter.
The Base line tent frames nearly unfit for use: not more than two have perfect hinges.
Four men sick in the camp, and three Sappers sick in Cape Town. The effective force insufficient for removing the Bars to the comparison shed this morning. Lieut. Cust is most active.

422. Bar B over a waggon road. 424. Delayed by the picket drivers. Five men sick in camp to-day: Lieut. Cust, C. P. Smyth, and myself, assist in carrying Bars and moving on the tents.

426. Hard ground: iron pickets only can be driven.

428. Low ground: the "myrtle bush" lining pole masked, ∴ the near struts are relied on for the continuation of the direction.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet
Feb. 5	a.m. 7 41	429	A B C E G	½ M N O Q R ½ S	75·2	52·5
	8 33	430	A B C E G	½ M N O Q R ½ S	79·9	52·5
	9 26	431	A B C E G	½ M N O Q R ½ S	84·0	52·5
	10 35	432 *	A B C E G	½ M N O Q R ½ S	89·6	52·5
	11 39	433	A B C E G	½ M N O Q R ½ S	91·2	52·5
	p.m. 0 33	434	A B C E G	½ M N O Q R ½ S	90·1	52·5
	1 19	435	A B C E G	½ M N O Q R ½ S	88·5	52·5
					(230	99·75)
1841.	h m				°	feet
Feb. 5	p m. 2 13	436	A B C E G	½ M N O Q R ½ S	87·5	52·5
	3 0	437	A B C E G	½ M N O Q R ½ S	84·9	52·5
	3 57	438	A B C E G	½ M N O Q R ½ S	82·7	52·5
	4 45	439 *	A B C E G	½ M N O Q R ½ S	80·7	52·5
	5 28	440	A B C E G	½ M N O Q R ½ S	77·2	52·5
	6 19	441	A B C E G	½ M N O Q R ½ S	73·8	52·5
„ 6	a.m. 6 59	442	A B C E G	½ M N O Q R ½ S	72·3	52·5
					(234	67·25)

432. Microscope R accidentally touched, and thrown from off its bar by one of the men. It was immediately compared with Q when their lengths appeared to be equal, but it does not rotate correctly. To be examined in the evening.

439. The signal pole referred to in the morning is now visible, and the preceding direction appears to be exactly in line.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.	DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet	1841.	h m				°	feet
Feb. 6	a.m. 7 59	443	*A B C E G*	½ M N O Q R ½ S	77·3	52·5	Feb. 6	p.m. 3 41	450	*A B C E G*	½ M N O Q R ½ S	79·8	52·5
	9 5	444	*A B C E G*	½ M N O Q R ½ S	79·8	52·5		4 35	451	*A B C E G*	½ M N O Q R ½ S	77·9	52·5
	10 57	445 *	*A B C E G*	½ M N O Q R ½ S	81·6	52·5		5 34	452 *	*A B C E G*	½ M N O Q R ½ S		52·5
	11 47	446	*A B C E G*	½ M N O Q R ½ S	82·8	52·5	,, 9	a.m. 7 23	453	*A B C E G*	½ M N O Q R ½ S	66·4	52·5
	p.m. 0 48	447	*A B C E G*	½ M N O Q R ½ S	83·1	52·5		8 21	454	*A B C E G*	½ M N O Q R ½ S	73·9	52·5
	1 48	448	*A B C E G*	½ M N O Q R ½ S	83·1	52·5		9 34	455	*A B C E G*	½ M N O Q R ½ S	81·3	52·5
	2 44	449	*A B C E G*	½ M N O Q R ½ S	82·2	52·5		10 37	456	*A B C E G*	½ M N O Q R ½ S	80·7	52·5
					(23834·75)							(24202·25)	

445. Drove a register picket at the advanced end of this series, marking 23624·75 conventional feet. The dot on the brass pin is small and deep, and marks the true point.

452. Drove a register picket at the advanced end of this set, marking 23992·25 conventional feet. The dot on the brass pin marks the true point. This position commands a better view of Coggera than picket 445.

February 9. Mr. Charles Bell, Assistant Surveyor-General, was present at the measurement of series 453 to 460.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.	DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet	1841.	h m				°	feet
Feb. 9	a.m. 11 44	457	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	77·6	52·5	Feb. 10	a.m. 6 44	464	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	61·3	52·5
	p.m. 0 50	458	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	82·6	52·5		7 47	465	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	71·9	52·5
	1 38	459	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	82·4	52·5		8 42	466	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	74·6	52·5
	2 41	460	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	80·8	52·5		9 48	467	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	78·3	52·5
	3 50	461	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	79·7	52·5		10 51	468	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	78·9	52·5
	4 48	462	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	74·6	52·5		11 35	469	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	79·8	52·5
	5 45	463	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	72·1	52·5		p.m. 0 26	470	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	81·7	52·5
					(245	69·75)						(249	37·25)

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.	DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet	1841.	h m				°	feet
Feb. 10	p.m. 1 32	471 *	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	79·7	52·5	Feb. 12	a.m. 10 6	478	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	84·9	52·5
	2 25	472	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	79·6	52·5		10 52	479	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	86·7	52·5
	3 13	473	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	78·8	52·5		11 47	480	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	87·4	52·5
	4 9	474	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	75·7	52·5		p.m. 0 40	481	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	91·3	52·5
,, 12	a.m. 7 25	475	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	71·0	52·5		1 43	482	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	90·4	52·5
	8 18	476	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	72·1	52·5		2 39	483	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	91·1	52 5
	9 10	477	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	78·6 (253	52·5 04·75)		3 25	484	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	88·6 (256	52·5 72·25)

471. The state of the Bar tents much impedes the progress of the operation: bar B from this cause was exposed to the sun for some time.

It may be proper to record again, that from the beginning up to the present time, the lettered half of the Microscope at each end of the series, which measures the three inches between the compensation point and the "point carrier," is used alternately with the unlettered half,—viz.: if the former, for example, is employed for series 471 the latter is employed for 472, to eliminate any constant error depending on the reversion of the outer Microscopes, in other words the bisection of the six inches. The distance between the foci of the outer Microscopes remain steady, whereas the half which depends on the mechanism of the collar work, does not.

February 11. Engaged finishing comparison shed No. 3, comparing bars, and clearing the line in advance of bush.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet
Feb. 12	p.m. 4 21	485	A B C E G	½ M N O Q R ½ S	86·3	52·5
	5 32	486	A B C E G	½ M N O Q R ½ S	82·1	52·5
„ 13	a.m. 10 31	487	A B C E G	½ M N O Q R ½ S	90·0	52·5
	11 22	488	A B C E G	½ M N O Q R ½ S	89·6	52·5
	p.m. 0 22	489	A B C E G	½ M N O Q R ½ S	93·8	52·5
	2 10	490 *	A B C E G	½ M N O Q R ½ S	94·3	52·5
	3 0	491	A B C E G	½ M N O Q R ½ S	92·7	52·5
					(260	39·75)
1841.	h m				°	feet
Feb. 13	p.m. 4 4	492	A B C E G	½ M N O Q R ½ S	89·1	52·5
„ 15	a.m. 8 15	493	A B C E G	½ M N O Q R ½ S	76·3	52·5
	9 16	494	A B C E G	½ M N O Q R ½ S	81·7	52·5
	10 14	495	A B C E G	½ M N O Q R ½ S	88·6	52·5
	11 14	496	A B C E G	½ M N O Q R ½ S	90·8	52·5
	p.m. 0 4	497	A B C E G	½ M N O Q R ½ S	97·2	52·5
	1 4	498	A B C E G	½ M N O Q R ½ S	97·7	52·5
					(264	07·25)

490. Drove a register picket at the advanced end of this series, marking 25987·25 conventional feet. Two dots on the brass correspond to the wire on reversion: the middle between them is the true point.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet
Feb. 15	p.m. 2 20	499	A B C E G	½ M N O Q R ½ S	93·7	52·5
	3 23	500	A B C E G	½ M N O Q R ½ S	91·3	52·5
	4 34	501	A B C E G	½ M N O Q R ½ S	86·3	52·5
	5 58	502	A B C E G	½ M N O Q R ½ S	81·4	52·5
„ 16	7 14	503	A B C E G	½ M N O Q R ½ S	69·4	52·5
	8 14	504	A B C E G	½ M N O Q R ½ S	74·6	52·5
	9 14	505	A B C E G	½ M N O Q R ½ S	84·0	52·5
					(267	74·75)

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet
Feb. 16	a.m. 10 4	506	A B C E G	½ M N O Q R ½ S	87·5	52·5
	10 59	507	A B C E G	½ M N O Q R ½ S	92·5	52·5
	p.m. 0 3	508	A B C E G	½ M N O Q R ½ S	94·7	52·5
	0 50	509	A B C E G	½ M N O Q R ½ S	96·2	52·5
	1 38	510	A B C E G	½ M N O Q R ½ S	96·9	52·5
	2 30	511	A B C E G	½ M N O Q R ½ S	93·8	52·5
	3 32	512	A B C E G	½ M N O Q R ½ S	90·6	52·5
					(271	42·25)

500. The cast-iron handle of the Microscope "carrying box" broke while in the hands of the man who was shifting it forward. The box fell, but the contents escaped injury.

512. Left off to compare Bars, and to afford an opportunity for clearing ground in advance.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.	DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet	1841.	h m				°	feet
Feb. 19	a.m. 7 18	513	*A B C E G*	½ M N O Q R ½ S	64·8	52·5	Feb. 19	p.m. 0 37	520	*A B C E G*	½ M N O Q R ½ S	77·5	52·5
	8 2	514	*A B C E G*	½ M N O Q R ½ S	67·8	52·5		1 23	521	*A B C E G*	½ M N O Q R ½ S	74·0	52·5
	8 41	515 *	*A B C E G*	½ M N O Q R ½ S	72·3	52·5		2 14	522	*A B C E G*	½ M N O Q R ½ S	74·6	52·5
	9 15	516	*A B C E G*	½ M N O Q R ½ S	72·6	52·5		3 0	523	*A B C E G*	½ M N O Q R ½ S	73·2	52·5
	10 8	517	*A B C E G*	½ M N O Q R ½ S	77·6	52·5		3 42	524	*A B C E G*	½ M N O Q R ½ S	73·1	52·5
	10 56	518	*A B C E G*	½ M N O Q R ½ S	80·7	52·5		4 37	525	*A B C E G*	½ M N O Q R ½ S	72·4	52·5
	11 39	519	*A B C E G*	½ M N O Q R ½ S	73·7	52·5		5 13	526	*A B C E G*	½ M N O Q R ½ S	69·7	52·5
					(275	09·75)						(278	77·25)

515. The sky clouded, which allowed of the two following sets being measured without tents. 787·5 feet were measured in less than 11½ hours.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet
Feb. 19	p.m. 5 59	527 *	A B C E G	½ M N O Q R ½ S	65·7	52·5
„ 20	a.m. 6 40	528	A B C E G	½ M N O Q R ½ S	53·5	52·5
	7 25	529	A B C E G	½ M N O Q R ½ S	57·8	52·5
	8 2	530	A B C E G	½ M N O Q R ½ S	66·0	52·5
	9 12	531	A B C E G	½ M N O Q R ½ S	73·4	52·5
	9 59	532 *	A B C E G	½ M N O Q R ½ S	75·4	52·5
	10 41	533 *	A B C E G	½ M N O Q R ½ S	75·0	52·5
					(282	44·75)
1841.	h m				°	feet
Feb. 20	a.m. 11 31	534	A B C E G	½ M N O Q R ½ S	79·1	52·5
	p.m. 0 24	535	A B C E G	½ M N O Q R ½ S	82·1	52·5
	1 13	536 *	A B C E G	½ M N O Q R ½ S	83·3	52·5
	2 13	537	A B C E G	½ M N O Q R ½ S	80·2	52·5
	3 7	538	A B C E G	½ M N O Q R ½ S	78·8	52·5
	4 10	539 *	A B C E G	½ M N O Q R ½ S	76·9	52·5
„ 24	a.m. 7 58	540	A B C E G	½ M N O Q R ½ S	76·6	52·5
					(286	12·25)

527. Measured without tents.

532 and 533. The Bars exposed to the sun while the tents were being carried forward. The Microscopes were screened by their "carrying box."

536. One of the men tripped while carrying the forward end of bar B and fell: his end of the Bar rested upon him, and received no injury.

539. The wind being dangerously strong the measurement was discontinued: for the same reason there was no measuring on Monday and Tuesday. In the meantime the men cleared more ground, and finished comparison shed No. 4. The instruments were examined, cleaned, and adjusted where necessary: the Microscopes by Mr. Maclear, the Bars by Captain Henderson.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.	DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet	1841.	h m				°	feet
Feb. 24	a.m. 8 54	541	A B C E G	{ ½ M N O Q R ½ S	85·4	52·5	Feb. 24	p.m. 2 53	548	A B C E G	{ ½ M N O Q R ½ S	94·1	52·5
	9 38	542	A B C E G	{ ½ M N O Q R ½ S	89·8	52·5		3 47	549	A B C E G	{ ½ M N O Q R ½ S	91·4	52·5
	10 22	543	A B C E G	{ ½ M N O Q R ½ S	93·3	52·5		5 21	550 *	A B C E G	{ ½ M N O Q R ½ S	83·8	52·5
	11 7	544	A B C E G	{ ½ M N O Q R ½ S	99·0	52·5	„ 25	a.m. 9 2	551	A B C E G	{ ½ M N O Q R ½ S	77·5	52·5
	11 52	545	A B C E G	{ ½ M N O Q R ½ S	102·0	52·5		9 54	552	A B C E G	{ ½ M N O Q R ½ S	80·2	52·5
	p.m. 0 40	546	A B C E G	{ ½ M N O Q R ½ S	96·9	52·5		10 46	553	A B C E G	{ ½ M N O Q R ½ S	83·9	52·5
	1 32	547	A B C E G	{ ½ M N O Q R ½ S	95·2	52·5		11 28	554	A B C E G	{ ½ M N O Q R ½ S	86·4	52·5
					(289	79·75)						(293	47·25)

550. Drove a register picket at the advanced end of this set, carrying a brass pin and dot, marking 29137·25 conventional feet. The locality is commonly called "the myrtle bush station," and marked with the letter M on the plan of the triangulation of the Base. From it both ends of the line become visible on ascending from the Salt River vale. The point appears to be about $1\frac{1}{4}$ inch north of the true line: rather it becomes necessary to move the lining Theodolite that quantity to bring its optical axis, the point, and the east end signal into the same vertical. This will be examined further when triangulating the base.

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DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.	DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet	1841.	h m				°	feet
Feb. 25	p.m. 0 11	555	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	84·6	52·5	Feb. 26	a.m. 8 48	562	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	76·0	52·5
	0 50	556	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	85·0	52·5		9 32	563	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	82·2	52·5
	1 52	557	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	87·2	52·5		10 17	564	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	85·8	52·5
	2 37	558	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	88·8	52·5		11 5	565	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	87·0	52·5
	3 21	559	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	90·8	52·5		11 50	566	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	90·9	52·5
	4 7	560	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	82·8	52·5		p.m. 0 30	567	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	90·3	52·5
„ 26	a.m. 7 53	561	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	70·8	52·5		1 14	568	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	91·7	52·5
					(297	14·75)						(300	82·25)

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.	DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet	1841.	h m				°	feet
Feb. 26		569	*A*	½ M			Feb. 27		576	*A*	½ M		
				N							N		
			B	O						*B*	O		
			C	Q						*C*	Q		
	p.m.		*E*	R				p.m.		*E*	R		
	2 20		*G*	½ S	88·5	52·5		0 8		*G*	½ S	81·4	52·5
		570	*A*	½ M					577	*A*	½ M		
				N							N		
			B	O						*B*	O		
			C	Q						*C*	Q		
			E	R						*E*	R		
	3 28		*G*	½ S	82·8	52·5		0 59		*G*	½ S	81·6	52·5
,, 27		571	*A*	½ M					578	*A*	½ M		
				N							N		
			B	O						*B*	O		
			C	Q						*C*	Q		
	a.m.		*E*	R						*E*	R		
	8 22		*G*	½ S	74·3	52·5		1 51		*G*	½ S	82·5	52·5
		572	*A*	½ M					579	*A*	½ M		
				N							N		
			B	O						*B*	O		
			C	Q						*C*	Q		
			E	R						*E*	R		
	9 16		*G*	½ S	80·4	52·5		2 38		*G*	½ S	81·7	52·5
		573	*A*	½ M					580	*A*	½ M		
				N							N		
			B	O						*B*	O		
			C	Q						*C*	Q		
			E	R						*E*	R		
	9 58		*G*	½ S	76·7	52·5		3 29		*G*	½ S	81·0	52·5
		574	*A*	½ M			Mar. 1		581	*A*	½ M		
				N							N		
			B	O						*B*	O		
			C	Q						*C*	Q		
			E	R				a.m.		*E*	R		
	10 43		*G*	½ S	77·9	52·5		8 48		*G*	½ S	87·4	52·5
		575	*A*	½ M					582	*A*	½ M		
				N							N		
			B	O						*B*	O		
			C	Q						*C*	Q		
			E	R						*E*	R		
	11 25		*G*	½ S	79·3	52·5		9 51		*G*	½ S	91·1	52·5
					(304	49·75)						(308	17·25)

570. Delayed by having to cut through a mound. Left off to compare Bars.
582. Privates J. George and Day adjusted Bars C and D of this series.
February 26. Fine weather.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.	DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet	1841.	h m				°	feet
Mar. 1	a.m. 10 44	583 *	A B C E G	½ M N O Q R ½ S	95·2	52·5	Mar. 1	p.m. 4 24	590	A B C E G	½ M N O Q R ½ S	97·0	52·5
	11 42	584	A B C E G	½ M N O Q R ½ S	98·8	52·5		5 19	591	A B C E G	½ M N O Q R ½ S	92·9	52·5
	p.m. 0 30	585	A B C E G	½ M N O Q R ½ S	102·0	52·5	„ 2	a.m. 7 41	592	A B C E G	½ M N O Q R ½ S	87·0	52·5
	1 20	586	A B C E G	½ M N O Q R ½ S	104·8	52·5		8 24	593	A B C E G	½ M N O Q R ½ S	89·3	52·5
	2 4	587	A B C E G	½ M N O Q R ½ S	102·9	52·5		9 44	594	A B C E G	½ M N O Q R ½ S	99·3	52·5
	2 53	588	A B C E G	½ M N O Q R ½ S	103·2	52·5		10 40	595	A B C E G	½ M N O Q R ½ S	101·4	52 5
	3 40	589	A B C E G	½ M N O Q R ½ S	100·4	52·5		11 26	596	A B C E G	½ M N O Q R ½ S	106·6	52·5
					(311	84·75)						(315	52·25)

583. Private Day adjusted B for level, &c., of this series.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.	DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet	1841.	h m				°	feet
Mar. 2	p.m. 0 24	597 *	*A B C E G*	½ M N O Q R ½ S	103·4	52·5	Mar. 5	p.m. 0 6	604	*A B C E G*	½ M N O Q R ½ S	78·6	52·5
	1 5	598	*A B C E G*	½ M N O Q R ½ S	100·0	52·5		0 46	605	*A B C E G*	½ M N O Q R ½ S	80·7	52·5
	1 44	599	*A B C E G*	½ M N O Q R ½ S	94·9	52·5		1 24	606	*A B C E G*	½ M N O Q R ½ S	81·0	52·5
	2 27	600	*A B C E G*	½ M N O Q R ½ S	96·6	52·5		2 7	607	*A B C E G*	½ M N O Q R ½ S	80·1	52·5
	3 12	601	*A B C E G*	½ M N O Q R ½ S	95·3	52·5		2 52	608	*A B C E G*	½ M N O Q R ½ S	78·6	52·5
„ 5	a.m. 10 43	602	*A B C E G*	½ M N O Q R ½ S	77·8	52·5		3 42	609 *	*A B C E G*	½ M N O Q R ½ S	77·7	52·5
	11 30	603	*A B C E G*	½ M N O Q R ½ S	78·1 (319	52·5 19·75)		4 36	610	*A B C E G*	½ M N O Q R ½ S	75·0 (322	52·5 87·25)

597, 598, and 599. Dangerous whirlwinds from the N.W.

March 3 and 4. Adjusting Microscopes. Heavy rain on the evening of the 3rd.

„ 5. Occupied three hours removing wet from the Bars, which gained admittance through the level windows on Wednesday night.

607. Whirlwinds.

609. Strong wind from S.W.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet
Mar. 5		611	*A*	½ M		
				N		
			B	O		
			C	Q		
			E	R		
	p.m. 5 16		*G*	½ S	72·8	52·5
„ 6		612	*A*	½ M		
				N		
			B	O		
			C	Q		
			E	R		
	a.m. 8 47		*G*	½ S	72·0	52·5
		613	*A*	½ M		
				N		
			B	O		
			C	Q		
			E	R		
	9 25		*G*	½ S	74·5	52·5
		614	*A*	½ M		
				N		
			B	O		
			C	Q		
			E	R		
	10 10		*G*	½ S	78·0	52·5
		615	*A*	½ M		
				N		
			B	O		
			C	Q		
			E	R		
	10 47		*G*	½ S	81·5	52·5
		616	*A*	½ M		
				N		
			B	O		
			C	Q		
			E	R		
	11 31		*G*	½ S	83·0	52·5
		617	*A*	½ M		
				N		
			B	O		
			C	Q		
			E	R		
	p.m. 0 13		*G*	½ S	86·8	52·5
						(32654·75)

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet
Mar. 6		618	*A*	½ M		
				N		
			B	O		
			C	Q		
			E	R		
	p.m. 0 48		*G*	½ S	89·1	52·5
		619	*A*	½ M		
				N		
			B	O		
			C	Q		
			E	R		
	1 32		*G*	½ S	91·8	52·5
		620	*A*	½ M		
				N		
			B	O		
			C	Q		
			E	R		
	2 28		*G*	½ S	90·0	52·5
		621	*A*	½ M		
				N		
			B	O		
			C	Q		
			E	R		
	3 16		*G*	½ S	84·4	52·5
		622	*A*	½ M		
				N		
			B	O		
			C	Q		
			E	R		
	5 18		*G*	½ S	82·2	52·5
„ 11		623	*A*	½ M		
				N		
			B	O		
			C	Q		
			E	R		
	a.m. 7 48		*G*	½ S	63·0	52·5
		624	*A*	½ M		
				N		
			B	O		
			C	Q		
			E	R		
	8 48		*G*	½ S	72·0	52·5
						(33022·25)

622. Drove a register picket at the end of this set, marking 32917·25 feet: the centre of the dot is about one-third of its diameter too easterly.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.	DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet	1841.	h m				°	feet
Mar. 11	a.m. 9 52	625	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	72 0	52·5	Mar. 11	p.m. 3 37	632	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	72·4	52·5
	10 46	626	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	72·2	52·5	,, 12	a.m. 9 14	633	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	72·7	52·5
	11 31	627	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	73·8	52·5		9 59	634	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	75·9	52·5
	p.m. 0 13	628	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	76·0	52·5		10 45	635	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	80·0	52·5
	1 3	629 *	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	76·6	52·5		11 36	636	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	85·2	52·5
	2 0	630	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	75·6	52·5		p.m. 0 37	637	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	90·0	52·5
	2 46	631	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	73·9 (333	52·5 89·75)		1 22	638	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	90·1 (337	52·5 57·25)

629 and 632. Dangerous puffs of wind from the south.

634. Calm.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.	DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet	1841.	h m				°	feet
Mar. 12	p.m. 2 11	639	*A B C E G*	½ M N O Q R ½ S	90·6	52·5	Mar. 13	a.m. 8 19	646	*A B C E G*	½ M N O Q R ½ S	71·8	52·5
	3 4	640	*A B C E G*	½ M N O Q R ½ S	86·1	52·5		9 33	647	*A B C E G*	½ M N O Q R ½ S	78·4	52·5
	4 1	641	*A B C E G*	½ M N O Q R ½ S	84·4	52·5		10 33	648	*A B C E G*	½ M N O Q R ½ S	84·4	52·5
	4 40	642	*A B C E G*	½ M N O Q R ½ S	82·0	52·5		11 29	649	*A B C E G*	½ M N O Q R ½ S	88·6	52·5
	5 23	643	*A B C E G*	½ M N O Q R ½ S	80·3	52·5		p.m. 0 13	650	*A B C E G*	½ M N O Q R ½ S	92·4	52·5
	6 8	644	*A B C E G*	½ M N O Q R ½ S	76·3	52·5		1 6	651 *	*A B C E G*	½ M N O Q R ½ S	94·0	52 5
,, 13	a.m. 7 28	645	*A B C E G*	½ M N O Q R ½ S	65·4	52·5		1 58	652	*A B C E G*	½ M N O Q R ½ S	96·7	52·5
					(341	24·75)						(344	92·25)

651. Occasional whirlwinds.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.	DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet	1841.	h m				°	feet
Mar. 13		653	A	{½ M			Mar. 15		660	A	{½ M		
				N							N		
		*	B	O						B	O		
			C	Q						C	Q		
	p.m.		E	R				a.m.		E	R		
	2 57		G	½ S	91·3	52·5		10 12		G	½ S	80·3	52·5
		654	A	{½ M					661	A	{½ M		
				N							N		
			B	O						B	O		
			C	Q						C	Q		
			E	R						E	R		
	3 51		G	½ S	90·7	52·5		11 24		G	½ S	79·4	52·5
		655	A	{½ M					662	A	{½ M		
				N							N		
			B	O						B	O		
			C	Q						C	Q		
			E	R				p.m.		E	R		
	4 44		G	½ S	89·2	52·5		0 22		G	½ S	80·6	52·5
		656	A	{½ M					663	A	{½ M		
				N							N		
			B	O						B	O		
			C	Q						C	Q		
			E	R						E	R		
	5 35		G	½ S	82·8	52·5		1 15		G	½ S	80·0	52·5
		657	A	{½ M					664	A	{½ M		
				N							N		
			B	O						B	O		
		*	C	Q					*	C	Q		
			E	R						E	R		
	6 19		G	½ S	76·0	52·5		2 8		G	½ S	79·4	52·5
„ 15		658	A	{½ M			„ 16		665	A	{½ M		
				N							N		
			B	O						B	O		
			C	Q						C	Q		
	a.m.		E	R				a.m.		E	R		
	7 34		G	½ S	68·5	52·5		7 5		G	½ S	62·9	52·5
		659	A	{½ M					666	A	{½ M		
				N							N		
			B	O						B	O		
			C	Q						C	Q		
			E	R						E	R		
	8 41		G	½ S	75·2	52·5		7 45		G	½ S	69·3	52·5
					(348	59·75)						(352	27·25)

653. Level of bar E — 7 divisions in error.
654. „ „ — 9 do.
655. „ „ — 5 do.
656. „ „ + 10·5 do.
657. Could not be brought to level. Five series of this Bar are seemingly inclined 40 divisions, or mean = —27·5 divisions.
664. Obliged to leave off owing to the violence of the wind.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet
Mar. 16	a.m. 8 32	667	*A* *B* *C* *E* *G*	$\frac{1}{2}$ M N O Q R $\frac{1}{2}$ S	75·2	52·5
	9 34	668	*A* *B* *C* *E* *G*	$\frac{1}{2}$ M N O Q R $\frac{1}{2}$ S	78·3	52·5
	10 34	669	*A* *B* *C* *E* *G*	$\frac{1}{2}$ M N O Q R $\frac{1}{2}$ S	82·0	52·5
	11 14	670	*A* *B* *C* *E* *G*	$\frac{1}{2}$ M N O Q R $\frac{1}{2}$ S	83·7	52·5
	11 58	671	*A* *B* *C* *E* *G*	$\frac{1}{2}$ M N O Q R $\frac{1}{2}$ S	86·2	52·5
	p.m. 0 37	672 *	*A* *B* *C* *E* *G*	$\frac{1}{2}$ M N O Q R $\frac{1}{2}$ S	90·0	52·5
	1 22	673	*A* *B* *C* *E* *G*	$\frac{1}{2}$ M N O Q R $\frac{1}{2}$ S	90·2	52·5
					(355	94·75)
1841.	h m				°	feet
Mar. 16	p.m. 2 13	674	*A* *B* *C* *E* *G*	$\frac{1}{2}$ M N O Q R $\frac{1}{2}$ S	88·2	52·5
	2 50	675	*A* *B* *C* *E* *G*	$\frac{1}{2}$ M N O Q R $\frac{1}{2}$ S	91·0	52·5
	3 20	676	*A* *B* *C* *E* *G*	$\frac{1}{2}$ M N O Q R $\frac{1}{2}$ S	87·2	52·5
	4 0	677	*A* *B* *C* *E* *G*	$\frac{1}{2}$ M N O Q R $\frac{1}{2}$ S	85·1	52·5
	4 47	678	*A* *B* *C* *E* *G*	$\frac{1}{2}$ M N O Q R $\frac{1}{2}$ S	82·0	52·5
	5 44	679	*A* *B* *C* *E* *G*	$\frac{1}{2}$ M N O Q R $\frac{1}{2}$ S	79·2	52·5
„ 17	a.m. 8 57	680	*A* *B* *C* *E* *G*	$\frac{1}{2}$ M N O Q R $\frac{1}{2}$ S	77·2	52·5
					(359	62·25)

672. Whirlwinds; afterwards calm until No. 678. Calm from No. 680 to 687.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.	DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet	1841.	h m				°	feet
Mar. 17	a.m. 9 40	681	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	82·9	52·5	Mar. 17	p.m. 2 54	688 *	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	91·7	52·5
	10 14	682	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	87·5	52·5		3 32	689	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	88·8	52·5
	10 46	683	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	90·3	52·5		4 22	690	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	86·0	52·5
	11 28	684	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	93·4	52·5	„ 18	a.m. 7 14	691	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	65·0	52·5
	p.m. 0 2	685	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	92·8	52·5		7 57	692	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	74·2	52·5
	0 41	686	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	95·4	52·5		8 47	693	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	81·4	52·5
	1 27	687	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	97·2	52·5		9 52	694	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	88·2	52·5
					(363	29·75)						(366	97·25)

688. Drove a register picket at the termination of this series, marking 36382·25 feet. The centre of the dot is rather to the apparent east of the wire.

691. The thermometer was in the comparison shed close by, and shaded.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.	DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet	1841.	h m				°	feet
Mar. 18	a.m. 10 58	695	*A* *B* *C* *E* *G*	{½ M { N O Q R ½ S	95·0	52·5	Mar. 18	p.m. 5 21	702	*A* *B* *C* *E* *G*	{½ M { N O Q R ½ S	86·8	52·5
	11 39	696	*A* *B* *C* *E* *G*	{½ M { N O Q R ½ S	100·0	52·5	,, 19	a.m. 8 22	703	*A* *B* *C* *E* *G*	{½ M { N O Q R ½ S	74·3	52·5
	p.m. 0 23	697	*A* *B* *C* *E* *G*	{½ M { N O Q R ½ S	102·8	52·5		9 34	704	*A* *B* *C* *E* *G*	{½ M { N O Q R ½ S	82·2	52·5
	2 18	698	*A* *B* *C* *E* *G*	{½ M { N O Q R ½ S	98·7	52·5		10 20	705	*A* *B* *C* *E* *G*	{½ M { N O Q R ½ S	86·0	52·5
	3 6	699	*A* *B* *C* *E* *G*	{½ M { N O Q R ½ S	95·3	52·5		11 14	706	*A* *B* *C* *E* *G*	{½ M { N O Q R ½ S	90·9	52·5
	3 53	700	*A* *B* *C* *E* *G*	{½ M { N O Q R ½ S	91·4	52·5		p.m. 0 3	707	*A* *B* *C* *E* *G*	{½ M { N O Q R ½ S	97·1	52 5
	4 34	701	*A* *B* *C* *E* *G*	{½ M { N O Q R ½ S	89·8	52·5		2 10	708	*A* *B* *C* *E* *G*	{½ M { N O Q R ½ S	97·4	52·5
					(370	64·75)						(374	32·25)

Comparing bars between 697 and 698. Hot puffs of wind from the westward.
Comparing bars between 707 and 708.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.	DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet	1841.	h m				°	feet
Mar. 19		709	*A*	½ M N			Mar. 20		716	*A*	½ M N		
			B	O						*B*	O		
			C	Q						*C*	Q		
	p.m.		*E*	R				a.m.		*E*	R		
	2 50	*	*G*	½ S	98·6	52·5		9 39		*G*	½ S	77·0	52·5
		710	*A*	½ M N					717	*A*	½ M N		
			B	O						*B*	O		
			C	Q						*C*	Q		
			E	R						*E*	R		
	3 36		*G*	½ S	95·1	52·5		10 24		*G*	½ S	79·6	52·5
		711	*A*	½ M N					718	*A*	½ M N		
			B	O						*B*	O		
			C	Q					*	*C*	Q		
			E	R						*E*	R		
	4 30		*G*	½ S	89·9	52·5		11 13		*G*	½ S	81·8	52·5
		712	*A*	½ M N					719	*A*	½ M N		
			B	O						*B*	O		
			C	Q					*	*C*	Q		
			E	R				p.m.		*E*	R		
	5 33		*G*	½ S	83·4	52·5		0 42		*G*	½ S	82·4	52·5
„ 20		713	*A*	½ M N					720	*A*	½ M N		
			B	O						*B*	O		
			C	Q						*C*	Q		
	a.m.		*E*	R						*E*	R		
	7 17		*G*	½ S	65·6	52·5		2 0		*G*	½ S	83·2	52·5
		714	*A*	½ M N					721	*A*	½ M N		
			B	O						*B*	O		
			C	Q						*C*	Q		
			E	R						*E*	R		
	8 2		*G*	½ S	69·6	52·5		3 3		*G*	½ S	80·8	52·5
		715	*A*	½ M N					722	*A*	½ M N		
			B	O						*B*	O		
			C	Q						*C*	Q		
			E	R						*E*	R		
	9 5		*G*	½ S	74·1	52·5		4 14		*G*	½ S	78·3	52·5
					(377	99·75)						(381	67·25)

709. Light air from S.W. then from N.W. Hot as from an oven: south horizon hazy. Lightning northward at 10 p.m.

718. Uneven ground.

719. Drove an iron picket for the lining theodolite plummet, and a point-carrier placed over it for counting: position on the top of the rise before descending into Buckle's vale.

March 20. The measurement retarded this day by misplaced pickets.

„ 21. Microscopes adjusted in the accidental temperature.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet
Mar. 22	a.m. 8 3	723	A B C E G	½ M N O Q R ½ S	73·9	52·5
	9 23	724	A B C E G	½ M N O Q R ½ S	75·2	52·5
	10 16	725	A B C E G	½ M N O Q R ½ S	82·3	52·5
	11 12	726	A B C E G	½ M N O Q R ½ S	81·8	52·5
	p.m. 0 7	727	A B C E G	½ M N O Q R ½ S	85·4	52·5
	0 58	728	A B C E G	½ M N O Q R ½ S	84·2	52·5
	1 43	729 *	A B C E G	½ M N O Q R ½ S	82·8	52·5 (38534·75)
1841.	h m				°	feet
Mar. 22	p.m. 2 31	730	A B C E G	½ M N O Q R ½ S	81·7	52·5
	3 13	731	A B C E G	½ M N O Q R ½ S	79·8	52·5
	4 5	732	A B C E G	½ M N O Q R ½ S	78·4	52·5
	5 2	733 *	A B C E G	½ M N O Q R ½ S	74·2	52·5
,, 25	a.m. 8 21	734	A B C E G	½ M N O Q R ½ S	67·1	52·5
	9 56	735	A B C E G	½ M N O Q R ½ S	71·7	52·5
	10 49	736	A B C E G	½ M N O Q R ½ S	75·0	52·5 (38902·25)

March 22. A strong and dangerous whirlwind at 45^{m} past noon; first from S.W. by W., then from the south: lasted about five minutes.

729. Dangerous descent from the preceding series.

733. Drove a register picket at the advanced end of this series, marking 38744·75 feet: the centre of the dot is too eastward by about a third part of its diameter.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.	DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet	1841.	h m				°	feet
Mar. 25	a.m. 11 37	737	*A B C E G*	½ M N O Q R ½ S	75·2	52·5	Mar. 29	a.m. 7 54	744	*A B C E G*	½ M N O Q R ½ S	62·0	52·5
	p.m. 0 18	738	*A B C E G*	½ M N O Q R ½ S	74·0	52·5		8 52	745	*A B C E G*	½ M N O Q R ½ S	67·9	52·5
		739	*A B C E G*	½ M N O Q R ½ S	76·9	52·5		10 17	746	*A B C E G*	½ M N O Q R ½ S	71·9	52·5
	2 20	740	*A B C E G*	½ M N O Q R ½ S	73·4	52·5	„ 18	11 3	747	*A B C E G*	½ M N O Q R ½ S	75·3	52·5
	3 12	741	*A B C E G*	½ M N O Q R ½ S	72·6	52·5		11 43	748	*A B C E G*	½ M N O Q R ½ S	78·4	52·5
	3 58	742	*A B C E G*	½ M N O Q R ½ S	71·3	52·5		p.m. 0 25	749	*A B C E G*	½ M N O Q R ½ S	79·9	52·5
	4 53	743	*A B C E G*	½ M N O Q R ½ S	68·6	52·5		1 7	750	*A B C E G*	½ M N O Q R ½ S	82·4	52·5
					(392	69·75)						(396	37·25)

March 25. Rain came on at the termination of series 743, which continued throughout the 26th and 27th: the time spent in cleaning and afterwards adjusting Microscopes in the accidental temperature. At 9 o'clock, p.m., on the 26th, the Barometer reading was 29·534 inches.

An Officer of the United States Navy, introduced by the American Consul, came to witness the operation and remained some days.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.	DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet	1841.	h m				°	feet
Mar. 29	p.m. 1 49	751	*A B C E G*	½ M N O Q R ½ S	81·7	52·5	Mar. 30	a.m. 10 1	758	*A B C E G*	½ M N O Q R ½ S	79·4	52·5
	2 35	752	*A B C E G*	½ M N O Q R ½ S	80·1	52·5		10 53	759	*A B C E G*	½ M N O Q R ½ S	84·4	52·5
	3 25	753	*A B C E G*	½ M N O Q R ½ S	78·1	52·5		11 51	760	*A B C E G*	½ M N O Q R ½ S	89·5	52·5
	4 17	754	*A B C E G*	½ M N O Q R ½ S	76·9	52·5		p.m. 0 43	761	*A B C E G*	½ M N O Q R ½ S	94·2	52·5
	5 4	755	*A B C E G*	½ M N O Q R ½ S	72·6	52·5		1 37	762	*A B C E G*	½ M N O Q R ½ S	89·3	52·5
,, 30	a.m. 7 19	756	*A B C E G*	½ M N O Q R ½ S	61·8	52·5		2 21	763	*A B C E G*	½ M N O Q R ½ S	85·8	52·5
	8 20	757	*A B C E G*	½ M N O Q R ½ S	69·9	52·5		3 8	764	*A B C E G*	½ M N O Q R ½ S	85·3	52·5
					(400	04·75)						(403	72·25)

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet
Mar. 30	p.m. 4 1	765	*A* *B* *C* *E* *G*	{½ M N O Q R ½ S	81·2	52·5
	4 47	766	*A* *B* *C* *E* *G*	{½ M N O Q R ½ S	78·5	52·5
	5 45	767	*A* *B* *C* *E* *G*	{½ M N O Q R ½ S	75·0	52·5
April 1	a.m. 7 52	768	*A* *B* *C* *E* *G*	{½ M N O Q R ½ S	62·4	52·5
	9 6	769	*A* *B* *C* *E* *G*	{½ M N O Q R ½ S	67·6	52·5
	10 0	770	*A* *B* *C* *E* *G*	{½ M N O Q R ½ S	72·8	52·5
	10 51	771	*A* *B* *C* *E* *G*	{½ M N O Q R ½ S	74·3	52·5
						(40739·75)

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet
April 1	a.m. 11 38	772	*A* *B* *C* *E* *G*	{½ M N O Q R ½ S	71·5	52·5
	p.m. 0 31	773	*A* *B* *C* *E* *G*	{½ M N O Q R ½ S	70·5	52·5
	1 23	774	*A* *B* *C* *E* *G*	{½ M N O Q R ½ S	70·2	52·5
	2 7	775	*A* *B* *C* *E* *G*	{½ M N O Q R ½ S	76·1	52·5
	2 54	776	*A* *B* *C* *E* *G*	{½ M N O Q R ½ S	73·4	52·5
	3 35	777	*A* *B* *C* *E* *G*	{½ M N O Q R ½ S	74·0	52·5
	4 22	778	*A* *B* *C* *E* *G*	{½ M N O Q R ½ S	75·9	52·5
						(41107·25)

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet
April 1	p.m. 5 16	779	A B C E G	½ M N O Q R ½ S	70·0	52·5
,, 2	a.m. 7 25	780	A B C E G	½ M N O Q R ½ S	60·6	52·5
	8 11	781	A B C E G	½ M N O Q R ½ S	63·2	52·5
	9 8	782	A B C E G	½ M N O Q R ½ S	68·5	52·5
	9 47	783	A B C E G	½ M N O Q R ½ S	70·0	52·5
	10 29	784	A B C E G	½ M N O Q R ½ S	73·0	52·5
	11 6	785	A B C E G	½ M N O Q R ½ S	75·0	52·5 (41474·75)

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet
April 2	a.m. 11 44	786	A B C E G	½ M N O Q R ½ S	77·2	52·5
	p.m. 0 33	787	A B C E G	½ M N O Q R ½ S	79·3	52·5
	1 14	788	A B C E G	½ M N O Q R ½ S	80·9	52·5
	1 58	789	A B C E G	½ M N O Q R ½ S	82·0	52·5
	2 35	790	A B C E G	½ M N O Q R ½ S	83·1	82·5
	3 16	791	A B C E G	½ M N O Q R ½ S	83·0	52·5
	4 25	792 *	A B C E G	½ M N O Q R ½ S	79·9	52·5 (41842·25)

792. A register picket driven at the advanced end of this series, carrying an iron pin, marking 41842·25 feet. The apparent west edge of the dot is the correct mark.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.	DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet	1841.	h m				°	feet
April 2		793	*A*	½ M N			April 3		800	*A*	½ M N		
			B	O						*B*	O		
			C	Q						*C*	Q		
	p.m.		*E*	R				a.m.		*E*	R		
	5 27	*	*G*	½ S	75·0	52·5		11 54		*G*	½ S	89·1	52·5
„ 3		794	*A*	½ M N					801	*A*	½ M N		
			B	O						*B*	O		
			C	Q						*C*	Q		
	a.m.		*E*	R				p.m.		*E*	R		
	7 15		*G*	½ S	60·5	52·5		0 31		*G*	½ S	88·1	52·5
		795	*A*	½ M N					802	*A*	½ M N		
			B	O						*B*	O		
			C	Q						*C*	Q		
			E	R						*E*	R		
	8 31		*G*	½ S	68·8	52·5		1 6		*G*	½ S	90·9	52·5
		796	*A*	½ M N					803	*A*	½ M N		
			B	O						*B*	O		
			C	Q						*C*	Q		
			E	R						*E*	R		
	9 21		*G*	½ S	73·0	52·5		1 42		*G*	½ S	91·4	52·5
		797	*A*	½ M N					804	*A*	½ M N		
			B	O						*B*	O		
			C	Q						*C*	Q		
			E	R						*E*	R		
	10 0		*G*	½ S	78·1	52·5		2 30		*G*	½ S	90·3	52·5
		798	*A*	½ M N					805	*A*	½ M N		
			B	O						*B*	O		
			C	Q						*C*	Q		
			E	R						*E*	R		
	10 38		*G*	½ S	81·2	52·5		3 16		*G*	½ S	88·4	52·5
		799	*A*	½ M N					806	*A*	½ M N		
			B	O						*B*	O		
			C	Q						*C*	Q		
			E	R						*E*	R		
	11 16		*G*	½ S	84·4	52·5		4 6		*G*	½ S	82·0	52·5
					(422	09·75)						(425	77·25)

793. The Microscope carrying box fell from the hands of the two men who were moving it forward, by which O and Q were tilled a little in their cells, and their levels slightly deranged. Their other adjustments were not disturbed.

DATE.	TIME.	No. of Series.	Bars.	Micro-scopes.	Therm.	Apparent Length.
1841.	h m				°	feet
April 3	p.m. 4 48	807	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	79·2	52·5
	5 45	808 *	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	72·2	52·5
„ 5	a.m. 7 42	809	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	63·0	52·5
	8 50	810 *	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	67·2	52·5
1841. April 5	a.m. 9 40	811 *	*A* *B* *C*	½ M N O ½ S		31·5
„ 20	p.m. 1 50	809	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	91·4	52·5
	2 55	810	*A* *B* *C* *E* *G*	½ M N O Q R ½ S	92·0	52·5
	5 0	811	*A* *B* *C*	½ M N O ½ S	82·0	31·5
						(42818·75)

808. A strong register picket driven, and a brass pin inserted at the advanced end of this series, marking 42682·25 feet. The centre of the dot is the correct point.

810. A strong register picket driven, and a brass pin inserted at the advanced end of this series, marking 42787·25 feet. The apparent east limb of the dot is the true mark.

811. These three bars were laid on to find, approximately, the position of the east terminal point. Four pickets driven at right angles to each other, carried marks to define the places of lines whose intersection denote the position.

April 20. Series 809 and 810 re-measured. 811, consisting of bars A, B, C, reached the platinum stud exactly wherein the puncture was made to define the east terminal point.

2. Errors of Alignment

When the measurement reached the elevated ground at M (*a*) where both ends of the Base came into view, that point was discovered to be a little north of the true line. This circumstance led to an examination of the measured line, for the purpose of applying corrections, if necessary. The examination was effected with the 20-inch Theodolite, by means of the signal poles which were stationed in the line for the triangulation of its parts, and by placing other poles over picket points which had been left for reference in the event of accident or uncertainty when measuring. § 5. Errors of Alignment.

From the west terminal point, signals 6194 (*b*), 9712, and 11497 seemed as one pole; hence a right line had been run to the latter point, but that point was 7·02 inches south of the true line.

Let l be the measured length. θ the inclination of the measured length to the true line: then $l—l\ 2 \sin.^2 \frac{\theta}{2} =$ the projection of the measured length upon the true line. But for inclinations of a few seconds the perpendicular distance p, from the true line, may be substituted for θ, and the projected length will sensibly be $l - \frac{p^2}{2\,l}$. The correction (2nd term) for the inclination of 11497 $= -$ 0·000179 inches.

Point 17797 was 6·64 inches south of the true line, or 0·38 inch more northerly than the last picket: the correction is insensible.

Point 21367 was 6·02 inches south of the true line, or 0·62 inch more northerly than 17797: the correction is $-$0·000005 inch.

Point 23992 was 0·96 inch south of the true line, or 5·06 inches north of the last point: the correction is $-$0·000406 inch.

Point 25987 was 0·09 inch south of the true line, or 0·87 inch north of the last picket: the correction is 0·000016 inch.

Point 29137 was 11·48 inches north of the true line, or 11·57 inches north of the last: the correction is 0·00177 inch.

The line was sensibly straight from the last point to the east end of the base: the correction is 0·000401 inch.

The sum of these corrections is $-$0·002778 inch = 0·000023 foot: to which is to be added a similar correction for series No. 20 (see page 257), = ·000332.

It is difficult in practice to plant points in a right line. Perhaps the best method would be as follows,—viz.: to centre a good theodolite at intervals of about one mile, and to shift it until the angles subtended by the terminal signals become 180° on each side. In the present instance, nearly one half of the base was directed to a point situated

(*a*) See plate.

(*b*) The numbers represent the distances in feet from the west end.

§ 5. Errors of Alignment.

about six inches south of the true line. The direction then inclined towards it during a run of 2625 feet, and coincided with it through a distance of 1995 feet. The next length of 3150 feet ran towards a point 11·5 inches north of the line, and the remaining 13681 feet straight to the east terminal point.

No satisfactory explanation can be given of the deviation at M. It may have commenced two series back when the signal at M was removed, to allow the picket drivers to proceed, and a directing upright could not be placed in advance until the removal of that signal; in the meantime, the direction rested with the stability of the lining instrument. On this supposition, the correction would be 0·052 inch; but there is no proof, and little probability, of the instrument having shifted.

The east end signal was not visible on the ascent to M.

Level Observations.

3. Level Observations for Section of the Base, and for its Mean Height above the Sea.

No register was kept of the varying heights of each series of compensation bars above the surface of the ground, because that method is less accurate perhaps, and certainly is more troublesome, than running a line of levels *per se.* The later operation was performed by Mr. C. P. Smyth, between the 8th of April and 10th of May, 1841, by means of a 14-inch spirit level. Taking intervals of 100 feet, he observed both forward and backward between the terminal points, and the results differed by less than one inch; therefore it has not been thought necessary to publish the numbers for both directions.

Captain Henderson, with the same instrument, carried a line of levels to the sea at Saldanha Bay, which he performed between the 24th of May and 28th of June; starting from a register picket, distant 4000 feet from the west end of the Base, and 31 feet 8 inches less elevated. At Saldanha Bay he jumped two holes in a rock, one six feet below the other, and distant from each other 31 feet 8 inches.

The following memorandum is quoted from his field-book:—"The rock is at the south part of the bay, where it begins to narrow southward, and opposite the south end of Schapen Island. From the rock is seen the pointed peaks of Jutten Island, over the low point on the south of Rietberg. The direction of the holes runs into the middle of the bay in Schapen Island.

"The lower hole was, according to the high water mark of June 26, below it 9 inches. On the morning of the 27th, the tide was about two inches above the surface of the rock where the lower hole is jumped. At $10\frac{1}{2}$ hours, a.m., on the morning of the 28th, high water was even with the surface of the rock in which the lower hole is jumped."

§ 5. Level Observations.

By the line of levels to Saldanha Bay, the starting picket on the Base is higher than the lower hole in the rock . . .		174·44 feet
By the line of levels on the Base, the starting picket is lower than the west terminal point	+	31·67 „
Mean level of the Base below the west terminal point . .		20·48 „
Mean height of the compensation-bar tongues above the ground (*a*) .	+	3·83 „
Mean level of the tongues above the lower hole in the rock at Saldanha Bay		189·46 „

Reduction to the sea level.

Assuming the radius of curvature in latitude 33° 15′, and Azimuth 71° 28′ to be [7·3208623], the reduction to the lower hole in the rock before mentioned is 0·3875 foot.

	ft. in.
(*a*) Mean height of trestles used on the base	1·10
Mean height of picket + thickness of triangles	1· 0
Mean height of camel	0· 9
Bar tongues above lower surface of box	0· 3
	3·10
	= 3·83 feet.

(TABLE I.)

No. of Station.	Distance backward and forward.	Back Staff.	Forward Staff.	Dip.	Rise.
APRIL 8, 1841.					
	feet.	inches.	inches.	inches.	inches.
* 1	100	14·60	62·70	48·10	
2	,,	49·65	61·75	12·10	
3	,,	51·55	60·10	8·55	
4	,,	50·90	61·15	10·25	
5	,,	50·95	62·48	11·53	
6	,,	51·14	55·70	4·56	
7	,,	50·20	55·60	5·40	
8	,,	36·04	66·50	30·46	
† 9	,,	39·42	68·05	28·63	
10	,,	41·35	66·10	24·75	
11	,,	38·12	62·08	23·96	
12	,,	43·37	58·45	15·08	
13	,,	27·58	63·35	35·77	
14	,,	45·65	60·75	15·10	
15	,,	35·27	58·40	23·13	
16	,,	53·63	62·90	9·27	
17	,,	47·40	58·39	10·99	
18	,,	43·06	56·77	13·71	
19	,,	46·58	56·98	10·40	
20	,,	42·47	79·72	37·25	
21	,,	50·02	52·75	2·73	
22	,,	70·42	35·98		34·44
23	,,	50·16	39·00		11·16
24	,,	49·52	56·76	7·24	
‡25	,,	15·32	59·41	44·09	
26	,,	55·59	21·65		33·94
27	,,	66·41	41·12		25·29
28	,,	41·95	43·70	1·75	
29	,,	57·27	42·78		14·49
30	,,	68·39	41·60		26·79
31	,,	66·33	53·12		13·21
32	,,	55·02	56·38	1·36	
33	,,	50·84	70·70	19·86	
34	,,	46·98	57·56	10·58	
35	,,	49·59	56·06	6·47	
36	,,	57·72	48·22		9·50
37	,,	58·50	65·03	6·53	
38	,,	55·59	57·88	2·29	
39	,,	47·20	46·74		0·46
40	,,	63·23	61·35		1·88
§41	,,	50·75	61·85	11·10	
APRIL 14, 1841.					
42	100	46·40	55·64	9·24	
43	,,	50·45	55·52	5·07	
	feet.	inches.	inches.	inches.	inches.
44	100	54·31	57·06	2·75	
45	,,	57·50	50·79		6·71
46	,,	53·12	59·22	6·10	
47	,,	50·28	51·49	1·21	
48	,,	52·73	48·93		3·80
49	,,	61·63	65·11	3·48	
50	,,	59·33	49·36		9·97
51	,,	58·52	54·98		3·54
52	,,	45·61	54·80	9·19	
53	,,	52·93	55·52	2·59	
54	,,	43·25	55·73	12·48	
55	,,	42·95	60·89	17·94	
56	,,	47·50	57·60	10·10	
57	,,	50·34	65·32	14·98	
58	,,	18·13	66·51	48·38	
59	,,	19·14	63·95	44·81	
60	,,	3·40	85·90	82·50	
61	,,	2·80	77·23	74·43	
62	,,	32·50	73·22	40·72	
63	,,	36·18	74·78	38·60	
64	,,	36·70	70·35	33·65	
65	,,	43·93	54·45	10·52	
66	,,	56·94	51·52		5·42
67	,,	59·50	47·91		11·59
68	,,	33·73	43·19	9·46	
69	,,	51·42	65·36	13·94	
70	,,	59·95	44·44		15·51
71	,,	40·10	48·95	8·85	
72	,,	61·85	73·72	11·87	
73	,,	53·00	54·08	1·08	
74	,,	78·60	60·38		18·22
75	,,	43·70	40·48		3·22
76	,,	29·62	58·39	28·77	
77	,,	60·22	75·66	15·44	
78	,,	16·80	57·32	40·52	
‖79	,,	58·18	44·33		13·85
¶80	,,	40·30	62·23	21·93	
81	50	82·00	17·56		64·44
82	,,	80·20	63·70		16·50
**83	100	58·00	51·20		6·80
84	,,	53·60	50·14		3·46
85	,,	56·40	37·00		19·40
86	,,	73·70	14·86		58·84
87	,,	63·10	35·69		27·41
88	,,	31·38	64·76	33·38	
89	,,	65·50	57·73		7·77
90	,,	65·02	66·41	1·39	

* 1. The back staff on the west terminal point. 1—6. Foggy; readings difficult. † 9. Fog clearing off.

‡ 25. Near Kotze's swamp. § 41. A picket driven. Sum of the back staff readings 1985·73

,, ,, forward staff readings 2307·56

Dip.. 321·83 inches.

Distance from west end................ 8200 feet.

‖ 79. Register picket 15802, about 3 feet beyond forward station. ¶ 80. Crossing the bed of the Salt River.

** 83. A picket driven at forward station 83. 41—83. Sum of the back staff readings 1983·74

,, ,, forward staff readings 2424·77

Dip.. 441·03 inches.

Distance from west end................ 16500 feet.

(TABLE I)—*cont.*

No. of Station.	Distance backward and forward.	Back Staff.	Forward Staff.	Dip.	Rise.
	feet.	inches.	inches.	inches.	inches.
91	100	39·00	53·75	14·75	
92	,,	62·87	40·52		22·35
93	,,	68·65	46·33		22·32
94	,,	59·75	60·53	0·78	
95	,,	54·76	59·71	4·95	
96	,,	61·60	47·17		14·43
*97	,,	69·85	41·48		28·37
APRIL 15, 1841.					
98	100	67·71	51·60		16·11
99	,,	54·00	64·48	10·48	
100	,,	36·82	69·60	32·78	
101	,,	56·53	52·40		4·13
102	,,	60·23	48·24		11·99
103	,,	73·82	44·38		29·44
104	,,	55·36	44·92		10·44
105	,,	39·45	43·80	4·35	
106	,,	59·30	47·85		11·45
107	,,	68·15	59·74		8·41
108	,,	60·73	40·80		19·93
109	,,	65·82	69·65	3·83	
110	,,	47·11	40·70		6·41
111	,,	47·24	65·26	18·02	
112	,,	59·80	44·80		15·00
113	,,	68·22	56·87		11·35
114	,,	60·21	46·72		13·49
115	,,	64·85	51·39		13·46
116	,,	72·80	51·08		21·72
117	,,	61·85	37·40		24·45
118	,,	74·65	42·90		31·75
119	,,	62·98	49·88		13·10
120	,,	65·83	17·73		48·10
121	,,	42·10	55·25	13·15	
122	,,	65·62	51·62		14·00
123	,,	66·45	46·60		19·85
124	,,	63·42	45·29		18·13
125	,,	69·83	52·30		17·53
126	,,	64·20	45·20		19·00
127	,,	60·96	40·67		20·29
128	,,	61·21	50·06		11·15
129	,,	55·70	41·85		13·85
130	,,	59·00	45·27		13·73
131	,,	70·69	46·80		23·89
132	,,	63·08	47·89		15·19
133	,,	67·30	29·73		37·57
134	100	71·84	34·65		37·19
135	,,	74·26	49·37		24·89
136	,,	49·18	52·22	3·04	
137	,,	65·87	40·80		25·07
138	,,	60·80	45·80		15·00
139	,,	52·55	51·38		1·17
140	,,	53·30	52·66		0·64
141	,,	66·37	45·88		20·49
142	,,	70·16	46·19		23·97
143	,,	61·22	46·60		14·62
144	,,	72·00	46·21		25·79
145	,,	60·48	39·00		21·48
146	,,	65·70	35·88		29·82
147	,,	51·96	49·72		2·24
148	,,	47·17	51·79	4·62	
149	,,	55·95	51·50		4·45
150	,,	54·08	42·88		11·20
151	,,	50·05	38·95		11·10
152	,,	52·83	52·24		0·59
153	,,	57·32	48·14		9·18
154	,,	46·60	54·89	8·29	
155	,,	40·15	55·73	15·58	
156	,,	48·32	55·13	6·81	
157	,,	52·53	55·27	2·74	
†158	,,	54·08	64·55	10·47	
159	,,	44·95	54·18	9·23	
160	,,	50·77	48·19		2·58
161	,,	61·24	55·62		5·62
162	,,	56·78	56·07		0·71
163	,,	52·46	41·36		11·10
164	,,	57·42	45·47		11·95
165	,,	58·17	53·76		4·41
166	,,	79·80	41·60		38·20
167	,,	56·45	55·00		1·45
168	,,	54·57	46·32		8·25
169	,,	60·95	51·06		9·89
170	,,	44·18	50·88	6·70	
171	,,	53·37	52·90		0·47
172	,,	62·65	34·05		28·60
173	,,	55·04	40·38		14·66
174	,,	55·30	63·50	8·20	
175	,,	66·80	74·05	7·25	
176	,,	51·60	55·95	4·35	
177	,,	58·23	58·50	0·27	
178	,,	57·76	53·77		3·99
179	,,	57·52	52·53		4·99
180	,,	60·90	50·10		10·80

* 97. A picket driven at the forward station 97.
Sum of the back staff readings 1825·18 inches.
,, ,, forward staff readings 676·08 ,,
Rise between 83 and 97............... 149·10 ,,
Distance of 97 from west end...... 19300 feet.

† 158. A picket driven at the forward end of this station.
Sum of the back staff readings from 97 to 158 = 3627·79 inches.
,, ,, forward staff readings .... = 2948·15 ,,
Rise between 97 and 158 .... = 679·64 ,,
Distance of 158 from west end..................... = 31500 feet.

(TABLE I)—*cont.*

No. of Station.	Distance backward and forward.	Back Staff.	Forward Staff.	Dip.	Rise.	No. of Station.	Distance backward and forward	Back Staff.	Forward Staff.	Dip.	Rise.
APRIL 16, 1841.							feet.	inches.	inches.	inches.	inches.
						209	50	77·75	64·05		13·70
	feet.	inches.	inches.	inches.	inches.	210	,,	71·40	40·23		31·17
181	100	67·56	50·87		16·69	211	,,	55·86	41·08		14·78
182	,,	56·53	47·98		8·55	212	,,	75·04	38·22		36·82
183	,,	60·60	64·80	4·20		213	,,	67·80	55·00		12·80
184	,,	67·25	58·55		8·70	214	,,	61·81	42·47		19·34
185	,,	44·80	70·00	25·20		215	,,	65·16	47·92		17·24
186	,,	45·32	62·63	17·31		216	,,	74·10	46·76		27·34
187	,,	38·00	50·80	12·80		217	,,	68·30	38·04		30·26
188	,,	42·70	70·08	27·38		218	,,	63·68	37·30		26·38
189	,,	48·63	60·77	12·14		219	,,	70·11	34·82		35·29
190	,,	54·14	57·38	3·24		220	,,	70·28	31·60		38·68
191	,,	42·55	75·62	33·07		221	,,	62·82	42·12		20·70
192	50	37·63	70·13	32·50		222	,,	72·59	49·71		22·88
193	,,	37·97	73·74	35·77		223	,,	64·71	46·13		18·58
194	,,	29·77	72·97	43·20		224	,,	52·32	53·40	1·08	
195	,,	35·92	75·83	39·91		225	,,	62·90	48·80		14·10
196	,,	32·97	66·05	33·08		226	,,	60·82	42·23		18·59
197	,,	41·06	65·97	24·91		227	,,	59·92	47·82		12·10
198	,,	41·45	69·75	28·30		228	,,	60·82	51·77		9·05
199	,,	60·90	33·77		27·13	229	,,	68·49	57·58		10·91
200	,,	54·43	49·41		5·02	230	,,	67·02	45·77		21·25
201	,,	34·98	78·72	43·74		231	,,	57·90	43·42		14·48
202	,,	47·38	45·00		2·38	232	,,	64·48	41·36		23·12
203	,,	50·62	49·42		1·20	233	,,	67·83	37·40		30·43
204	,,	74·38	45·07		29·31	234	,,	58·80	46·01		12·79
205	,,	61·52	50·42		11·10	235	,,	67·00	42·88		24·12
206	,,	57·63	52·40		5·23	236	,,	59·77	46·57		13·20
207	,,	58·83	54·39		4·44	237	,,	59·40	49·80		9·60
208	,,	59·19	43·58		15·61	*238	50	57·62	27·75		29·87

238. A mark on the block of masonry carrying the east terminal point.

Sum of back staff readings from No. 158	=4588·12
,, ,, forward staff readings	4139·35
Rise	448·77
Mark above wire	4·80
Mark below surface of brass plug which carries the terminal point	6·00
Rise from No 158 to east terminal point	459·57

By station No. 41	Dip = 321·83	}	− 762·86
No. 83	Dip = 441·03	}	
No. 97	Rise = 149·10	}	
No. 158	Rise = 679·64	}	1288·31
East point	Rise = 459·57	}	

Difference in height between the east and west terminal points	525·45
Difference by the levellings repeated backward, but not printed	524·59
Mean =	525·02 inches.
	= 43·9·02 feet.

LEVEL OBSERVATIONS

BETWEEN THE

ZWARTLAND BASE-LINE, AND THE SEA

AT

SALDANHA BAY, CAPE OF GOOD HOPE.

NOTE.—The departure is from a point in the Base-line, $31^{ft.}$ $8^{in.}$ below the platinum stud, marking the west terminal point of the Base.

(TABLE II.)

☾ MAY 24, 1841.

Distance.	Back Staff.	Forward Staff.	REMARKS.
feet.	ft. inches.	ft. inches.	
600	2 5·9	4 2·5	Commenced at picket left on line by Mr. Smyth near Mr. Kotze's house (80).
,,	3 8·5	4 6·6	
,,	3 11·5	3 7·4	
600	7 4·6	2 2·5	
268	2 10·5	7 2·9	
600	2 2·0	6 2·8	
,,	3 9·7	8 2·2	
400	4 2·6	2 10·6	
600	4 6·4	5 7·4	
,,	4 6·0	6 1·6	
,,	2 8·5	5 5·8	
600	2 11·2	4 11·6	
400	3 1·5	4 9·7	
600	4 3·8	4 8·1	
,,	2 7·6	5 4·4	
600	3 6·7	4 11·2	
	58 11·0	81 1·3	A.
		58 11·0	
		22 2·3	
600	2 2·6	3 11·0	Re-levelled the former portion, commencing at picket left on line by Mr. Smyth near Mr. Kotze's house.
,,	3 11·2	4 1·6	
,,	3 7·4	3 6·4	
600	7 8·5	2 8·5	
363	1 9·3	7 7·5	
600	2 5·0	5 0·0	
,,	4 2·0	7 6·2	
,,	6 7·0	6 5·4	
,,	3 3·1	5 6·0	
,,	3 1·3	4 2·5	
,,	3 3·7	5 11·0	
,,	3 4·0	4 2·4	
,,	2 3·4	5 5·8	
600	2 3·0	5 5·3	
460	3 11·7	4 7·0	............A.
	53 11·2	76 2·6	
		53 11·2	
		22 3·4	Former levelling.
		22 2·3	
		1·1	Difference.

♂ MAY 25, 1841.

Distance.	Back Staff.	Forward Staff.	REMARKS.
feet.	ft. inches.	ft. inches.	
600	4 4·5	5 3·2	A.
,,	3 11·2	3 9·0	
,,	5 1·4	1 7·8	
,,	5 2·3	5 2·8	
,,	5 2·8	3 9·2	
,,	4 5·8	4 2·6	
,,	5 1·4	3 10·2	
,,	4 1·7	6 0·4	
600	2 9·8	6 3·0	
260	1 11·5	9 8·5	
600	2 11·6	3 7·4	
,,	6 1·4	4 7·2	
600	4 8·8	3 4·6	
400	5 3·9	2 6·6	
600	8 0·4	1 0·0	97 4·6
,,	8 0·8	2 6·0	91 4·4
,,	5 8·3	4 2·0	
,,	4 4·6	3 6·6	6 0·2
,,	2 7·0	5 2·4	
,,	3 11·3	5 0·0	
600	3 2·4	6 0·9	............B.
	97 4·6	91 4·4	

♃ MAY 27, 1841.

Distance.	Back Staff.	Forward Staff.	REMARKS.
600	2 11·4	5 8·4	B.
,,	3 10·4	4 6·6	
,,	5 9·6	3 8·5	
,,	6 9·1	2 9·4	
,,	5 4·6	3 0·6	
,,	4 11·4	5 9·7	
600	1 9·6	7 1·9	
400	2 7·3	6 5·6	
600	9 5·7	1 0·3	
,,	6 1·7	2 0·8	
,,	4 9·6	5 7·8	93 6·3
,,	5 5·9	2 10·2	65 7·7
,,	5 0·5	2 6·1	
,,	5 1·4	3 2·7	27 10·6
,,	4 6·7	3 0·4	
,,	4 4·6	2 0·3	
,,	6 3·0	1 1·2	
,,	8 1·8	2 11·2	............C.
	93 6·3	65 7·7	

(TABLE II)—*cont.*

♀ MAY 28, 1841.

Distance. feet.	Back Staff. ft.	inches.	Forward Staff. ft.	inches.	REMARKS.
600	2	4·6	5	1·5	B.
,,	3	6·6	4	6·6	Re-levelled the work done yesterday.
,,	5	6·6	2	11·2	
,,	6	0·2	2	9·3	
,,	5	0·5	3	9·0	
,,	3	10·4	6	0·7	
,,	1	0·4	7	2·4	
,,	5	9·0	1	5·4	
,,	7	10·1	1	1·0	
,,	5	8·2	5	1·3	
,,	5	6·4	5	1·7	86 8·4
,,	5	4·9	2	11·2	58 11·9
,,	4	9·3	2	0·3	
,,	4	0·6	2	8·5	27 8·5
,,	5	6·6	2	6·6	
600	6	5·5	2	5·2	
720	8	2·5	1	2·0	C.
	86	8·4	58	11·9	Moved the camp to Thee Fontein.
600	6	5·5	2	5·2	C.
460	8	5·4	3	4·6	
560	8	2·6	2	7·7	
600	9	8·2	1	4·1	
600	9	3·3	0	2·4	
400	9	10·1	1	0·6	
300	9	10·8	3	6·9	
320	8	10·2	1	2·2	D.
	70	8·1	15	9·7	
	15	9·7			
	54	10·4			

♄ MAY 29, 1841.

Distance. feet.	Back Staff. ft.	inches.	Forward Staff. ft.	inches.	REMARKS.
600	6	5·2	2	11·4	C.
440	8	3·4	2	10·5	Re-levelled the above portion.
600	9	0·0	2	6·2	
600	8	8·5	1	0·7	
400	8	1·8	1	4·8	
400	5	11·5	1	0·4	
400	9	7·8	1	0·6	
400	10	0·0	2	8·5	
330	6	1·4	1	8·7	D.
	72	3·6	17	3·8	
	17	3·8			
	54	11·8			

Distance. feet.	Back Staff. ft.	inches.	Forward Staff. ft.	inches.	REMARKS.
600	6	2·5	2	9·5	C.
460	8	4·5	2	11·0	On adding up in pencil the re-levelling of Friday's work, I made some mistake, which I did not discover, and hence this third levelling.
600	8	11·2	2	6·0	
600	9	1·4	1	6·0	
400	8	4·0	1	7·4	
,,	6	0·6	1	0·4	
,,	9	3·1	1	0·1	
400	10	0·1	2	7·8	
340	6	1·5	1	7·2	D.
	72	4·9	17	7·4	54 10·4
	17	7·4			11·8
					9·5
	54	9·5			54 10·57
360	1	8·2	6	1·5	D.
460	7	7·6	1	6·3	
340	9	9·3	0	10·5	
200	10	0·7	3	0·5	
430	2	10·2	3	1·0	
400	7	6·8	0	9·2	
500	9	3·4	1	8·5	E.
					48 10·2
	48	10·2	17	1·5	17 1·5
					31 8·7

♂ JUNE 1, 1841.

Distance. feet.	Back Staff. ft.	inches.	Forward Staff. ft.	inches.	REMARKS.
500	2	6·2	1	6·1	D.
300	5	6·4	3	9·0	44 10·7
300	8	11·0	0	9·5	13 2·4
200	9	7·4	3	0·1	
500	2	8·4	1	0·6	31 8·3
400	7	7·9	0	7·6	
390	7	11·4	2	5·5	E.
	44	10·7	13	2·4	
400	7	9·7	3	8·3	E.
500	9	9·9	4	2·2	
400	9	4·7	1	2·5	
500	8	7·1	1	2·3	
400	3	6·5	3	7·6	
600	9	1·4	2	9·3	6 6·8
,,	6	6·8	0	4·9	
,,	6	9·3	0	4·8	
600	6	5·0	5	0·4	
400	8	6·4	3	6·4	
600	8	10·6	3	6·2	
,,	4	5·7	4	0·5	
,,	3	1·9	3	11·5	
,,	5	0·4	1	1·5	
,,	5	7·8	4	3·7	

(TABLE II)—*cont.*

Distance.	Back Staff.	Forward Staff.	REMARKS.
feet.	ft. inches.	ft. inches.	
600	5 8·5	6 7·2	
400	5 9·9	2 11·0	
400	9 9·6	1 10·1	
600	6 5·6	5 1·4	F. 131 6·6
			59 5·8
	131 6·6	59 5·8	
			72 0·8
600	5 1·4	6 5·6	F.
400	1 10·2	9 10·0	Levelled back again this morning's work.
400	3 0·2	5 10·8	
600	6 6·3	5 8·4	
600	4 3·1	5 6·3	
600	1 2·4	4 11·0	
600	3 9·5	3 3·5	
600	4 4·7	4 9·0	
600	3 7·0	9 0·3	
400	3 4·4	8 6 0	
600	5 5·3	6 1·3	
500	0 7·8	6 11·0	
500	2 1·7	7 10·6	
600	2 5·0	5 8·6	131 1·2
400	0 9·7	6 0·1	59 0·6
430	5 5·4	7 4·6	
460	2 1·2	9 3·5	72 0·6
600	0 4·2	8 9·4	
520	2 7·1	9 1·2	E.
	59 0·6	131· 1·2	

☿ JUNE 2, 1841.

Distance.	Back Staff.	Forward Staff.	REMARKS.
400	7 9·6	3 6·4	E.
500	9 8·6	4 2·6	On re-levelling, I was aware that a 9 had been put down instead of a 6, viz.: at the 7th ⊙, the first levelling. I was, however, determined to do it again this morning.
400	9 2·8	1 0·3	
500	8 8·1	1 4·0	
400	3 6·4	3 7·0	
600	9 0·8	2 7·4	
,,	6 7·1	0 6·2	
,,	6 10·5	0 7·1	
,,	6 7·0	5 2·5	
400	8 5·3	3 7·9	
600	9 1·0	3 8·1	
,,	4 8·5	4 4·4	
,,	3 5·0	3 10·2	
,,	5 0·0	1 3·1	
,,	5 8·0	4 5·4	138 0·3
600	5 10·6	6 8·1	65 11·9
400	5 11·0	3 1·1	
,,	10 0·5	1 11·6	72 0·4
400	6 8·1	5 3 8	
200	5 1·4	5 0·7	F.
	138 0·3	65 11·9	

Distance.	Back Staff.	Forward Staff.	REMARKS.
feet.	ft. inches.	ft. inches.	
600	7 3·8	5 4·0	F.
400	8 9·0	4 10·5	
600	3 0·0	3 7·8	
,,	5 8·1	7 11·2	
,,	2 10·1	4 6·2	
,,	4 2·5	4 4·2	
,,	5 10·6	4 3·5	57 9 8
,,	6 0·0	6 3·6	56 4·6
,,	5 2·0	4 10·2	
600	3 11·2	4 9·2	1 5·2
400	5 0·5	5 6·2	G.
	57 9·8	56 4·6	
400	5 6·2	5 0·5	G.
600	4 10·9	4 1·0	Levelled the line back of this day, and finding a difference of 1 foot evidently at the last ⊙ but one 9·1·8 instead of 8·1·8
,,	4 10·2	5 1·3	
,,	6 2·5	6 0 0	
,,	4 3·3	5 10·2	
,,	4 5·2	4 3·8	
,,	4 5·3	2 8·7	
,,	7 10·9	5 6·0	
600	3 6·7	3 0·5	
400	4 5·2	9 1·8	
600	5 3·2	7 4·6	F. The line was levelled again.
	55 9·6	58 2·4	58 2·4
			55 9·6
			2 4·8

♃ JUNE 3, 1841.

Distance.	Back Staff.	Forward Staff.	REMARKS.
600	7 1·7	5 2 3	F.
400	9 0·2	5 1·2	
,,	2 11·8	3 7·6	
,,	5 6·8	7 10·4	
,,	2 8·5	4 5·7	
,,	4 3 4	4 3 6	
,,	5 10·3	4 4·0	
,,	6 1·3	6 2·4	
,,	5 2 2	4 9·1	57 8·4
600	3 8·7	4 9·0	56 2·4
400	5 1·5	5 7·1	G.
	57 8·4	56 2·4	1 6·0
400	4 11 1	4 0·7	G.
600	4 8·2	4 4·3	
,,	6 1·7	6 0·2	
600	3 11·4	4 0·3	
400	3 9·4	4 0·8	

Distance.	Back Staff.	Forward Staff.	REMARKS.
feet.	ft. inches.	ft. inches.	
600	5 8·8	2 9 3	
600	2 7·7	4 5·2	
400	5 2·2	1 3 8	
600	8 4·7	7 7·5	
400	1 4·3	2 11·4	
400	6 6·8	6 4·5	
500	2 4·5	2 8·2	
600	5 2·7	6 5·9	
,,	5 1·8	5 1·1	75 8·0
,,	5 6·2	4 5·0	75 9·2
600	4 0 5	6 1·0	H.
	75 8·0	72 9·2	2 10·8
600	6 1·0	4 0·5	H.
,,	4 6·1	5 7·3	Levelled the line of this morning back.
,,	5 1·0	5 2·7	
600	6 9·1	5 5·8	
500	2 11·6	2 7·5	
400	6 6·2	6 7·3	
400	3 2 0	1 8·4	
600	7 7·6	8 4 0	
400	1 5·4	5 5·0	
600	4 9·4	2 9·3	
600	2 8·5	5 6·4	
400	4 0·0	3 9·1	
600	4 0·2	4 2·7	
,,	6 8·1	6 7·5	77 8·0
600	4 4·6	4 9·0	74 9·9
400	4 1·1	4 11·5	G.
	74 9·9	77 8·0	2 10·1

♀ JUNE 4, 1841.

Distance.	Back Staff.	Forward Staff.	REMARKS.
500	4 1·4	2 5·7	H.
500	6 1·7	8 2·6	
600	3 10·1	3 9 5	
600	5 0·2	4 0·5	
400	2 9·4	4 8·0	
500	4 10·6	5 6·5	
300	4 5·8	4 5·5	42 10·3
400	3 9·0	5 3·2	41 6·2
600	6 6·0	4 4·8	I.
	41 6·2	42 10·3	1 4·1
			Moved the camp to Eland's Fontein.

♄ JUNE 5, 1841.

Distance.	Back Staff.	Forward Staff.	REMARKS.
feet.	ft. inches.	ft. inches.	
500	4 2·4	2 7·5	H.
500	6 4·3	8 6·9	Re-levelled yesterday's work.
600	4 0·3	3 10·0	
600	4 10 7	3 9·5	
400	2 8·9	4 7·4	
500	5 1·0	5 7·5	
300	4 9·2	4 5·2	43 6·1
400	3 7·3	5 4·8	42 2·3
600	6 6·2	4 7·0	I.
	42 2·3	43 6·1	1 3·8
600	3 0·1	5 6·8	I.
600	4 7·2	4 2·1	
,,	3 6·9	3 7·3	
600	5 5·2	4 5·4	
200	3 3·2	5 10 7	
600	3 6·5	5 10·2	
400	7 9·3	4 11·1	
400	3 2·4	7 3·8	
600	2 0·8	5 0·0	
600	2 8·7	4 11·0	
400	5 0·1	5 8·0	
400	5 2·3	7 2·7	
600	3 3·6	7 11·4	
,,	3 6·1	3 4·0	
600	1 1·2	4 9·4	90 8·3
400	8 2·7	1 5·5	69 5·3
500	3 11·0	8 6·9	K.
	69 5·3	90 8·3	21 3·0
600	2 10·7	5 5·2	I.
,,	4 7·4	4 2·3	Re-levelled the work.
,,	3 7·0	3 8·4	The ground was high, and the line running in the direction of the setting sun, it was difficult at times to read off, as the object glass could not be screened. I determined, therefore, to level this again on Monday.
600	5 7·1	4 7·2	
200	3 6·3	6 3·0	
600	3 7·1	5 8·5	
400	7 11·0	5 0 8	
400	3 3·8	7 6·4	
600	2 1·5	4 11·4	
600	2 8·0	4 11·5	
400	5 0·6	5 8·6	
400	5 2·5	7 2·8	
600	3 3·0	7 10·5	
,,	3 5·3	3 4·5	
600	1 2·5	4 9·1	91 9·0
400	8 3·5	1 8·2	70 0·8
500	3 9·5	8 8·6	K.
	70 0·8	91 9·0	21 8·2

(TABLE II)—*cont.*

Distance.	Back Staff.	Forward Staff.	REMARKS.
	☾ JUNE 7, 1841.		
feet.	ft. inches.	ft. inches.	
600	2 10·6	5 3·0	I.
”	4 4·2	4 1·0	
”	3 7·0	3 9·7	
600	5 6·9	4 6·6	
200	3 4·9	6 1·8	
600	3 5·6	5 2·8	
400	7 7·5	5 0·4	
400	3 2·5	7 4·9	
600	1 11·2	4 7·7	
600	2 5·6	4 8·5	
400	4 11·4	5 9·6	
400	5 3·4	7 4·2	
600	3 5·1	7 11·2	
600	3 9·1	3 6·2	
600	1 0·6	5 0·5	90 11·2
400	8 6·4	1 7·5	69 8·4
500	4 2·4	8 9·6	K.
			21 2·8
	69 8·4	90 11·2	
200	1 5·8	7 7·3	Left off at noon, in consequence of the high wind, and the levelling being over the sandhills at Eland's Fontein.
600	2 7·7	2 8·6	
400	4 7·8	8 8·3	
400	2 9·6	3 10·0	
400	5 7·4	4 1·6	
			26 11·8
	17 2·3	26 11·8	17 2·3
			9 9·5
	♂ Rain until noon, when the wind became so high as to prevent using the level.		
	☿ RAIN ALL DAY.		
	♃ JUNE 10, 1841.		
200	1 4·3	7 6·7	Re-levelled Monday's work.
600	2 6·6	2 7·4	
400	5 1·8	9 2·3	27 5·7
”	2 10·3	3 10·5	17 8·0
400	5 9·0	4 2·8	
			9 9·7
	17 8·0	27 5·7	

Distance.	Back Staff.	Forward Staff.	REMARKS.
feet.	ft. inches.	ft. inches.	
340	3 5·4	5 7·2	
200	0 4·6	9 0·2	
600	0 0·0	8 3·0	
400	2 10·4	9 0·1	
600	3 11·2	4 2·5	
”	4 3·7	9 8·2	
600	2 10·0	6 9·6	
400	2 2·3	4 8·9	
400	3 9·1	4 7·1	
600	4 11·6	6 11·1	
400	3 2·6	2 3·4	
600	7 7·8	9 11·3	
”	1 6·2	5 8·0	
”	3 10·9	6 4·7	
600	5 6·8	4 5·0	
500	6 3·0	4 11·1	
200	5 5·6	8 10·3	
200	0 0·8	10 0·0	
200	0 8·3	8 5·9	
400	4 5·4	8 2·0	
600	5 6·1	9 0·4	153 5·3
400	6 3·0	1 2·1	93 2·8
200	9 10·8	0 2·7	
400	4 1·2	5 0·5	60 2·5
	93 2·8	153 5·3	
400	5 0·5	4 1·2	Levelled the line back again.
200	0 2·7	9 7·1	
400	1 1·2	6 5·3	
600	9 0·8	5 8·6	
400	8 5·9	4 4·1	
200	7 10·3	0 3·2	
200	9 10·1	0 0·3	
200	9 7·1	6 1·2	
500	5 0·0	6 6·5	
600	4 8·8	5 9·0	
”	6 6·3	3 10·2	
”	5 9·0	1 10·6	
600	9 5·8	7 1·5	
400	2 3·6	3 2·0	
600	6 11·5	4 11·4	
400	4 6·0	3 9·2	
400	4 10·0	2 3·4	
600	6 10·0	2 8·8	
”	9 3·8	4 0·4	
600	4 1·7	3 10·2	
400	9 0·8	2 11·2	153 3·6
600	8 1·7	0 3·0	93 1·0
200	9 3·5	0 1·6	
340	5 2·5	3 3·0	60 2·6
	153· 3·6	93 1·0	

(TABLE II)—*cont.*

Distance.	Back Staff.		Forward Staff.		REMARKS.
♀ JUNE 11, 1841.					
feet.	ft.	inches.	ft.	inches.	
440	5	8·0	5	9·5	
600	2	1·0	2	9·9	
450	3	7·4	8	11·3	
600	6	2·4	9	6·3	
600	4	8·8	2	11·6	
400	4	9·2	2	1·4	
600	6	3·8	7	1·4	
400	0	3·0	2	11·3	
400	5	7·1	8	3·1	
600	2	4·5	3	6·4	
”	6	11·2	5	0·3	
600	4	0·0	5	7·6	
400	3	7·5	2	7·1	
600	7	10·1	8	8·7	
600	5	2·3	6	3·1	
500	7	6·5	6	7·1	
400	2	7·0	6	1·0	
300	6	10·7	1	5·4	
400	3	11·5	7	4·2	125 3·5
400	4	11·9	9	1·7	101 8·4
400	6	4·5	4	1·2	
300	0	2·0	8	3·9	23 7·1
	101	8·4	125	3·5	
300	8	3·9	0	2·0	Levelled the line back.
400	4	1·7	6	2·8	
400	9	0·0	4	11·8	
400	7	3·8	4	1·0	
300	1	6·7	6	9·8	
400	5	11·1	2	4·8	
500	6	5·4	7	6·0	
600	6	2·5	4	11·6	
600	8	7·2	7	9·6	
400	2	6·2	3	8·4	
600	5	10·1	4	1·2	
”	5	0·5	6	11·2	June 12, 13, and 14 raining.
600	3	7·2	2	2·7	
400	8	0·6	5	5·1	June 15, moved to Massenberg.
400	2	9·8	0	4·0	
600	7	3·5	6	7·6	
400	2	4·4	5	0·6	
600	3	0·8	4	6·0	
600	9	5·5	6	2·4	126 4·3
450	9	8·0	4	7·6	102 9·1
600	3	1·3	2	3·1	
440	6	0·1	5	9·8	23 7·2
	126	4·3	102	9·1	

Distance.	Back Staff.		Forward Staff.		REMARKS.
☿ JUNE 16, 1841.					
feet.	ft.	inches.	ft.	inches.	
320	2	6·1	6	8·4	
500	3	4·4	4	2·1	
280	5	4·4	6	3·5	
240	2	11·2	6	0·3	
600	2	5·2	5	6·0	
300	3	11·3	5	10·8	
340	3	8·0	4	2·1	
280	2	11·7	4	9·0	
400	4	1·4	6	0·5	
400	3	4·5	5	7·4	70 2·3
”	3	4·5	6	2·1	44 8·6
”	4	10·3	3	5·0	
400	1	9·6	5	5·1	25 5·7
	44	8·6	70	2·3	
320	2	5·6	6	7·8	Re-levelled this morning's work.
500	3	5·2	4	2·8	
280	5	2·7	6	3·2	
240	3	2·6	6	4·6	
600	2	7·4	5	7·0	
300	3	9·5	5	8·4	
340	3	9·2	4	4·3	
280	3	0·3	4	11·4	
400	4	3·5	6	1·7	
”	3	5·6	5	8·5	71 1·6
”	3	4·5	6	4·1	45 6·7
”	4	11·2	3	4·4	
400	1	11·4	5	5·4	25 6·9
	45	6·7	71	1·6	
♃ JUNE 17, 1841.					
380	3	9·7	6	0·9	
300	3	2·3	5	10·2	
400	7	0·2	3	11·1	
300	1	10·1	7	5·4	
500	5	8·6	5	11·3	
400	7	2·6	6	0·4	
300	2	0·6	4	8·2	
400	4	2·5	6	11·3	Obliged to leave off from the high wind, 11½ a.m.
600	4	10·8	6	0·0	
400	5	0·4	6	11·8	
400	5	4·1	5	4·5	
300	5	5·0	3	8·6	82 5·6
600	5	6·8	8	9·3	65 9·4
400	4	5·7	4	8·6	16 8·2
	65	9·4	82	5·6	

(TABLE II)—*cont.*

Distance.	Back Staff.	Forward Staff.	REMARKS.
♄ JUNE 19, 1841.			
feet.	ft. inches.	ft. inches.	
380	3 10·4	6 6·8	Re-levelled Thursday's work.
300	3 9·5	5 11·5	
400	7 1·9	4 2·0	
300	1 5·1	7 0·4	
500	5 8·6	6 0·6	
400	7 6·6	6 2·3	
300	2 3·0	5 1·1	
400	4 6·4	7 2·3	
600	4 11·4	6 0·4	84 6·6
400	4 11·7	6 11·5	67 9·9
400	5 5·6	5 8·5	
300	5 8·7	4 0·5	16 8·7
600	5 11·6	8 11·2	
400	4 5·4	4 7·5	
	67 9·9	84 6·6	
400	4 6·0	5 4·3	
600	4 6·2	6 0·4	
600	6 5·0	4 6·3	
400	5 0·4	2 3·1	
„	7 10·0	6 5·0	
„	1 4·1	5 8·5	
„	3 9·8	6 0·6	
400	4 7·2	4 7·2	
340	6 2·0	3 8·7	
400	5 2·8	2 8·6	
500	4 0·2	8 8·5	
600	0 2·0	7 7·6	76 3·5
400	1 9·8	5 2·8	74 9·9
„	4 4·1	3 11·0	
400	9 9·5	1 8·2	1 5·6
240	6 8·4	0 3·1	
	76 3·5	74 9·9	
400	4 5·6	5 4·4	Re-levelled this morning's work.
600	4 6·3	5 11·7	
600	6 2·3	4 3·8	
400	5 1·0	2 3·3	
„	7 9·0	6 5·4	
400	1 6·8	5 10·4	
„	3 11·2	6 1·4	
400	4 9·5	4 9·2	
340	6 3·1	3 10·2	
400	5 4·6	2 9·4	
500	3 9·2	8 7·5	
600	0 3·6	7 9·0	76 5·3
400	1 6·2	4 10·0	74 10·8
„	5 0·1	4 7·4	
400	9 8·4	1 0·1	1 6·5
240	6 2·4	0 3·6	
	76 5·3	74 10·8	

Distance.	Back Staff.	Forward Staff.	REMARKS.
☾ JUNE 21, 1841.			
feet.	ft. inches.	ft. inches.	
200	10 1·2	3 1·8	Obliged to leave off at 11 a.m., in consequence of the rain.
400	4 11·6	4 4·0	
600	2 11·2	4 9·3	
400	1 6·3	9 3·4	22 6·9
400	1 10·0	1 0·4	21 4·3
	21 4·3	22 6·9	1 2·6
♂ JUNE 22, 1841.			
200	9 8·1	2 9·6	Re-levelled yesterday's work.
400	4 11·4	4 3·1	22 10·2
600	3 6·2	5 5·3	21 7·4
400	1 7·4	9 3·7	
400	1 10·3	1 0·5	
	21 7·4	22 10·2	1 2·8
300	10 1·4	0 6·1	
400	9 8·1	2 11·1	
500	5 8·4	3 8·4	
400	3 11·7	2 3·3	
400	8 7·5	1 9·4	
400	4 3·1	5 6·5	
400	4 1·6	3 7·4	
400	3 11·1	7 5·2	
„	5 7·7	5 4·9	
„	5 11·3	5 0·4	
„	5 9·1	4 7·8	
„	5 8·0	4 3·1	
„	2 5·7	6 0·3	
„	6 6·2	7 3·0	
„	2 11·2	5 5·5	
„	2 10·6	5 7·4	
400	3 10·1	7 6·2	
400	3 10·7	4 9·6	
„	3 8·2	4 8·6	
„	3 9·7	4 8·4	
„	3 4·1	4 1·7	
„	6 3·5	3 5·7	
400	8 1·3	1 5·6	
300	8 1·4	0 5·0	
200	9 9·0	0 1·6	
200	9 4·3	0 0·0	183 11·9
„	8 8·2	0 10·0	117 5·3
200	8 2·6	0 7·2	
400	8 0·2	4 3·0	66 6·6
„	5 7·6	3 9·1	
400	5 0·3	5 1·8	
	183 11·9	117 5·3	

(TABLE II)—*cont.*

Distance.	Back Staff.	Forward Staff.	REMARKS.
feet.	ft. inches.	ft. inches.	
400	5 1·8	5 0·3	Re-levelling of this day's work.
,,	3 9·7	5 8·2	
400	4 5·6	8 2·4	
200	0 7·2	8 3·3	
,,	0 10·8	8 10·6	
,,	0 1·8	9 6·3	
200	0 4·3	9 9·6	
300	0 6·7	8 3·0	
400	1 5·6	8 2·3	
,,	3 7·4	6 5·0	
,,	4 2·2	3 3·2	
,,	4 7·1	3 9·4	
,,	4 9·2	3 10·4	
,,	4 10·6	3 10·6	
,,	7 6·4	3 10·2	
,,	5 8·4	3 0·1	
,,	5 7·5	3 1·2	
400	7 4·3	6 7·1	
400	6 0·5	2 6·1	
,,	4 3·6	5 8·0	
,,	4 7·6	5 11·3	
,,	5 1·6	5 11·8	
,,	5 5·4	5 7·6	
,,	7 5·6	4 0·4	
,,	3 8·0	4 3·2	
,,	5 9·0	4 3·3	
,,	1 8·0	8 7·2	185 9·7
400	2 4·4	4 0·5	119 1·5
500	3 9·0	5 8·3	———
400	2 10·6	9 8·7	66 8·2
300	0 3·6	9 10·1	———
	119 1·5	185 9·7	

☿ JUNE 23, 1841.

400	5 8·2	5 7·5	
400	3 5·3	4 5·6	
200	6 11·5	2 9·4	
400	8 1·2	1 2·4	
,,	4 5·6	5 5·8	
,,	4 10·0	6 0·0	
400	2 10·2	9 9·6	
180	1 4·4	6 1·4	
400	1 1·2	9 2·1	
400	5 7·3	5 3·4	
300	2 6·2	9 8·8	
350	5 2·0	5 2·5	
400	6 3·2	4 8·8	
,,	4 5·6	6 6·8	
400	4 0·6	7 0·5	

Distance.	Back Staff.	Forward Staff.	REMARKS.
feet.	ft. inches.	ft. inches.	
200	3 1·0	9 4·1	
400	5 5·1	6 11·5	
400	8 1·1	1 9·6	135 11·2
400	8 8·7	2 5·3	98 2·2
500	5 6·4	9 6·8	———
400	0 3·2	9 3·8	37 9·0
400	0 2·2	7 3·5	———
	98 2·2	135 11·2	
400	7 3·5	0 2·2	Re-levelling the line of this morning back again.
400	9 3·5	0 3·1	
500	9 6·5	5 5·5	
400	2 5·5	8 9·8	
400	1 11·6	8 2·5	
400	7 0·4	5 5·2	
200	9 4·1	3 1·2	
400	6 11·8	4 0·5	
400	6 6·4	4 5·4	
400	4 10·3	6 4·5	
350	5 3·4	5 2·5	
300	9 9·1	2 6·4	
400	5 3·4	5 7·0	
400	9 2·3	1 2·0	
180	6 1·6	1 5·7	
400	9 11·4	2 11·0	
,,	6 0·4	4 10·1	
,,	5 6·1	4 5·4	136 11·0
400	1 2·3	8 2·0	99 0·9
200	2 10·4	7 1·3	———
400	4 7·7	3 6·6	37 10·1
400	5 9·3	5 9·0	———
	136 11·0	99 0·9	

♀ JUNE 25, 1841.

400	2 5·4	7 6·0	
,,	2 6·2	8 4·1	
,,	1 7·1	8 11·5	
400	0 0·2	10 1·2	
300	1 10·0	9 0·8	
400	2 5·4	6 3·0	
,,	2 6·0	7 3·4	
,,	0 5·1	8 11·5	
400	0 0·1	9 11·1	
300	1 2·6	8 7·0	120 5·4
300	0 2·3	9 11·0	18 4·2
240	0 6·8	9 4·4	———
180	1 2·3	9 2·7	102 1·2
200	0 4·7	6 11·7	———
	18 4·2	120 5·4	

(TABLE II)—*cont.*

Distance.	Back Staff.	Forward Staff.	REMARKS.
feet.	ft. inches.	ft. inches.	
200	6 11·7	0 4·7	Levelled the line of this morning back again.
180	9 4·3	1 4·3	
240	9 5·6	0 7·8	
300	9 9·8	0 0·8	
300	8 7·3	1 2·0	
400	9 9·5	0 1·0	
"	9 2·8	0 5·6	
"	7 3·1	2 5·1	
400	6 3·4	2 6·7	
300	9 0·1	1 9·7	
400	10 0·8	0 0·0	120 10·3
"	8 10·4	1 7·6	18 8·3
"	8 6·1	3 7·7	
400	7 7·4	2 5·3	102 2·0
	120 10·3	18 8·3	

♄ JUNE 26, 1841.

Distance.	Back Staff.	Forward Staff.	REMARKS.
200	7 11·0	2 2·1	
400	1 9·8	9 11·0	
270	0 2·9	9 10·1	
260	0 4·5	9 6·0	
300	0 0·0	9 1·6	
270	0 4·1	9 3·0	
400	0 2·0	8 5·0	
500	1 4·5	9 0·6	
"	2 2·3	8 7·0	
500	1 2·4	7 7·2	
300	1 8·2	7 0·5	
400	2 8·6	6 4·5	
300	2 11·0	6 5·3	
470	3 1·7	8 9·0	
140	0 0·7	8 5·3	
240	1 11·0	6 6·7	150 8·8
100	0 7·0	8 6·6	46 1·6
400	7 3·8	5 6·4	
500	5 4·1	3 6·8	104 7·2
480	4 10·0	6 0·1	
	46 1·6	150 8·8	
480	6 0·1	4 10·0	Re-levelling of this morning's work.
500	3 7·0	5 4·4	
400	5 6·6	7 4·8	
100	8 6·7	0 7·1	
240	6 8·4	2 0·2	
140	8 6·0	0 4·2	
470	9 1·2	3 3·1	
300	6 7·0	2 10·6	
400	6 5·1	2 9·6	

Distance.	Back Staff.	Forward Staff.	REMARKS.
feet.	ft. inches.	ft. inches.	
300	7 0·1	1 7·5	
500	7 7·4	1 2·6	
"	8 6·7	2 4·0	
500	9 2·3	1 4·8	
400	8 5·6	0 1·0	
270	9 3·0	0 5·2	152 1·1
300	9 2·6	0 1·2	47 4·8
260	9 7.5	0 7·1	
270	10 0·8	0 4·6	104 8·3
400	9 11·2	1 9·7	
200	2 1·8	7 11·1	
	152 1·1	47 4·8	

☉ JUNE 27, 1841.

Distance.	Back Staff.	Forward Staff.	REMARKS.
416	4 9·3	4 6·8	32 10·7
300	3 0·6	6 1·1	25 11·9
400	5 8·2	4 8·7	
400	6 10·2	5 7·1	6 10·8
300	2 9·6	5 9·5	
300	2 10·0	6 1·5	The levelling rod placed on the surface of the rock, over the upper hole jumped in it.
	25 11·9	32 10·7	
	9 4·5		
	3 4 5	6 0·0	=Difference in height between the two holes jumped in the rock, distance between the holes 31ft. 8in.
			The lower hole is according to the high water mark of yesterday, below it 9 *inches.*
			The direction of the two holes runs into the middle of a Bay in Schapen Island.

The rock in which the two holes are jumped is at the south part of the Bay where it begins to narrow southwards, and opposite the south end of "Schapen Island." From the rock is seen the pointed peaks of Jutten Island, over the low point on the south of Riet Bay.

Two large stones were placed over the holes jumped in the rock, the holes about two inches deep.

The tide this morning was about two inches above the surface of the rock where the lower hole is jumped.

(TABLE II)—*cont*

Distance.	Back Staff.	Forward Staff.	REMARKS.	Distance.	Back Staff.	Forward Staff.	REMARKS.
feet.	ft. inches.	ft. inches.		☾ JUNE 28, 1841.			
300	6 2·0	2 10·4	Re-levelling of this morning's work.				
300	5 10·1	2 9·8	33 3·4				The high water mark observed this morning at 10½ a.m., was even with the surface of the rock in which the lower hole is jumped.
400	5 7·6	6 10·4	26 4·5				
400	4 8·0	5 11·2	6 10·9				
300	6 4·3	3 2·1					
416	4 7·4	4 8·6					
	33 3·4	26 4·5	I observed the back (last ⊙) station, and on re-observing found it 4·7·4 instead of 9·4 as I had entered it.				

COLLECTING THE RESULTS.

Dip.		Rise.	
feet.	inches.	feet.	inches.
22	2·85	6	0·20
1	3·95	27	9·55
21	2·90	54	10·57
9	9·60	31	8·50
60	2·55	72	0·60
23	7·15	1	5·60
25	6·30	2	10·45
16	8·45	1	6·05
1	2·70	66	7·40
37	9·55		
102	1·60		
104	7·75		
6	10·85		
433	4·20	264	10·92

	ft.	inches.
Depression of upper hole................ =	168	5·28
	6	0 00
Depression of lower hole, or sea level, below the starting point on the Base-line...	174	5·28

§ 6.

§ 6. Reduction of the Microscope intervals to Temperature 62° Fahrenheit.

Of the 42818·75 feet, the apparent length of the Base, 40780 feet were measured in terms of the compensation bars, and 2039 in terms of the 6-inch brass standard (page 244) to which the microscopes were referred.

Royal Ast. Society's and Imperial Standard.

By Mr. Baily's report on the Royal Astronomical Society's 5 feet scale (Ast. Soc. Mem., vol. 9, pages 101 and 119) the first six inches are less than the mean six inches of the centre yard, by 0·000031 inch. But the centre yard exceeds the Imperial Standard yard, by 0·000374 inch, or 0·000063 on six inches. Therefore the first six inches of the Royal Astronomical Society's scale, exceeds six inches of the Imperial Standard by 0·000032 inch, equivalent to 0·1305 inch on 2039 feet.

No further allusion need be made to the Imperial Standard; for independent of the quantity being small, the Cape six-inch standard will be expressed in terms of the Ordnance Standard, in the calculation of the Cape arc of the meridian.

The elaborate discussion of the experiments, carefully conducted by Captain Yolland, Royal Engineers, at Southampton, in the year 1844—1846, and published in the account "of the Measurement of the Loch Foyle Base," assign cogent reasons for assuming the

Expansion of 6-inch Standard.

expansion of the Ordnance 6-inch brass standard to be 0·00000982, on unity for one degree of Fahrenheit. The same expansion is adopted for the Cape standard, since the only known difference between them consists in the difference of their volumes; the recorded depth of the former being 0·55 inch, whereas the depth of the latter is 0·35 inch.

The comparisons of the intervals between the foci of the outer microscopes with the 6-inch standard were exceedingly difficult to manage, which may be gathered from the registered temperature of the air while measuring the base. As before mentioned, the the thermometer rested upon one of the bars near the middle of each series, screened from the sun by the tents on one side, the canvass of the opposite side clued up, and a thorough draught from end to end.

The average temperature of the 88 days, while measuring, is 80°·16; the extreme range from 20° to 30° occasionally on the same day: therefore it became necessary to watch for the temperatures in which the preceding comparisons of the standard with the microscopes were made, in order to discover if the wires had shifted; but as this could seldom be hit exactly, such examinations fall short of the precision attainable by means of micrometer microscopes.

Adjustments for length on six-inch Standard.

The attempt to estimate small differences in length, by comparing the images of the dots with the diameters of the wires, is uncertain; it was the practice, therefore, when consecutive comparisons were made under considerable differences in temperature, and on two or three occasions of accident to a microscope,—to adjust the wires to exact bisection. Upon the whole, however, as far as the eye could detect, the wires retained their positions with admirable pertinacity: indeed, they were never known to shift, except from accidental violence.

§ 6. Adjustments for length on six-inch Standard.

The microscopes were adjusted for length at the following dates, and temperatures of the six-inch standard as indicated by its attached thermometer,—irrespective of the occasional examinations when they appeared to be correct.

1840.—October	20	M	65·5
		N	64·2
		O	69·5
		P	73·0
		Q	68·1
		R	66·9
		S	62·4
„ November	30	M	62·0
		N	66·5
		O	62·8
		P	63·8
		Q	66·9
		R	63·3
		S	65·8
„ December	6	P	59·4
„ „	12	O	62·8
		Q	65·0
		S	66·0
„ January	20	M	70·0
		N	69·3
		O	68·8
		Q	68·8
		R	68 8
		S	69·7

1840.—January	25	S	65·8
„ „	30	M	67·4
		N	63·2
		O	69·5
		Q	70·7
		R	72·3
		S	66·7
„ March	4	M	73·6
		N	73·6
		O	73·6
		Q	73·6
		R	73·6
		S	74·1
„ „	21	M	77·0
		N	79·0
		O	78·5
		Q	78·4
		R	78·2
		S	76·0
„ „	26 & 27	M	61·4
		N	61·6
		O	60·1
		Q	61·9
		R	60·0
		S	76·0

On April 21, the day after the east terminal point was fixed, the following comparisons were made at sunrise.

Microscope S, temperature 63°·0, exceeds the standard by about $\frac{1}{2}$ diameter of a dot.
„ M, „ 63·5, less by a minute quantity.
„ N, „ 63·5, exactly the length of the standard.
„ O, „ 64·8, less by about $\frac{1}{6}$ diameter of dot.
„ Q, „ 65·2, less by about $\frac{1}{5}$ diameter of dot.
„ R, „ 66·5, less by about $\frac{1}{8}$ diameter of dot.

As S had been adjusted to the length of the standard in the temperature 76°·0, it was left over the standard until the attached thermometer indicated 76°, when the dots were found exactly bisected.

(The diameter of each dot or puncture on the 6-inch standard is 0·00139 inch.)

The result of this examination is in pretty close accordance with the adjustments on the 26th and 27th of March, making allowance for the difference in temperature of the standard on that occasion.

§ 6.
Calculation of reduction for temperature.

The following table exhibits the elements and calculation of the reduction to temperature 62°, where

Columns 1 and 2, show the intervals between the points on the line, reckoned from the west end, and the number of series in each interval.

„ 3, give the number of bars in each series (n).

„ 4—10, distinguish the microscopes.

„ 5, gives the sum of the excess or defect in temperature of the several microscopes, over or under 62° ($\Sigma\, t^{\circ}$).

„ 6, gives the resulting correction to 62° in inches, assuming the expansion of the standard to be 0 0000589 on six inches, for one degree of the thermometer.

Reduction $= 0{\cdot}0000589 \times n \times \Sigma\, t^{\circ}$.

REDUCTION OF THE SIX-INCH STANDARD TO 62° FAHRENHEIT, FOR THE INSTANTS WHEN THE MICROSCOPES WERE ADJUSTED FOR LENGTH.

BASE-LINE.—TABLE III.

INTERVALS.	No. of Series in each interval (n).	No. of Bars = No. of Microscopes in each series.	MICROSCOPES.							$\Sigma\, t^{\circ}$.	Reduction $=0{\cdot}0000589 \times n \times \Sigma\, t^{\circ}$.
										+ °	inch +.
0— 40	40	6	½ N	M	O	P	Q	R	½ S	33·65	0·079280
40— 43	3	4	½ N	M	O			R	½ S	16·55	·002924
43— 55	12	4	½ N	M	O	P			½ S	22·65	·016009
55— 87	32	5	½ N	M	O	P		R	½ S	27·55	·051926
87— 88	1	5	½ N	Q	O	½ M		R	½ S	21·55	·001269
88— 91	3	5	½ N	M	O	P		R	½ S	27·55	·004868
91—106	15	5	½ N	M	O	P	Q		½ S	28·75	·025401
106—108	2	5	½ N	M	O	P		R	½ S	27·55	·003245
108—166	58	5	½ N	M	O	P	Q		½ S	28·75	·098216
166—179	13	5	½ M	N	O	P		R	½ S	10·30	·007887
										Sum	·291025
179—214	35	5	½ M	N	O	P		R	½ S	10·30	·021233
214—230	16	5	½ M	N	O	P		R	½ S	5·90	·005560
230—249	19	5	½ M	N	O		Q	R	½ S	13·40	·014996
249—250	1	5	½ M	N	O		Q	R	½ S	11·60	·000683
250—334	84	5	½ M	N	O		Q	R	½ S	11·60	·057392
										Sum	·099864
334—357	23	5	½ M	N	O		Q	R	½ S	11·60	·015715
357—385	28	5	½ M	N	O		Q	R	½ S	35·55	·058629
385—402	17	5	½ M	N	O		Q	R	½ S	33·60	·033644
402—452	50	5	½ M	N	O		Q	R	½ S	32·75	·096449
452—550	98	5	½ M	N	O		Q	R	½ S	32·75	·189040
										Sum	·393477
550—601	51	5	½ M	N	O		Q	R	½ S	32·75	·098380
601—688	87	5	½ M	N	O		Q	R	½ S	58·25	·298490
										Sum	·396870
688—722	34	5	½ M	N	O		Q	R	½ S	58·25	·116652
722—743	21	5	½ M	N	O		Q	R	½ S	80·60	·099694
743—810	67	5	½ M	N	O		Q	R	½ S	2·30	·009076
810—811	1	3	½ M	N	O				½ S	4·40	0·000259
										Sum	0·225681

The sum of the values from $n \times \Sigma t^{\circ} \times 0{\cdot}0000589$ is 1·4069 inches = 0·11724 feet, *additive* to the apparent length of the Base: and the mean of the several microscopes, during the measurement, was equal in length to the six-inch brass standard in the temperature 67°·9 nearly,—assuming the compensation of the microscopes to be perfect. The mean temperature of the atmosphere under the Base-line tents was 80·2 nearly.

§ 6. Reduction of the Microscope intervals to 62°.

§ 7. Verification of the Base by Triangulation.

§ 7.

Sections of the Base.

For the purpose of verifying the registered number of bars, the Base was divided into six unequal sections as follows, reckoning from the *east* terminal point,—viz.: 6436·5, 7245·0, 5145·0, 6195·0, 8085·0, and 9712·25 feet, numbered consecutively 1, 2, 3, &c.

Selection of Stations. and plan of the triangles.

The plate on the left hand page represents the plan of the triangles. The recognoisance for selecting the stations occupied ten days, and those which were adopted were the most favourable that could be found.

Advancing along the line from the *west* end, a swell of the ground on the right masks the positions at the desired distance. The descent to the Salt River vale begins at register picket 11497 feet from the west end; and at 1600 feet the river crosses the line; from thence there is a gradual undulating ascent to picket 29137·25: throughout this interval there is but one commanding rise to the right,—viz.: the north end of the long undulation which forms the east bank of the Salt River vale, upon which stands, near G, the Coggera farm house. From this position, with two exceptions, the line is visible from the west end to picket 29137·25. The first exception is unimportant; the second extends between pickets 14857·25 and 23624·75, and serves the purpose only of connecting the left hand stations. From 29137·25 to the east terminal point, the ground is more favourable.

On the left side of the line, the only available distant station is close to the Uyle Kraal farm house, which was occupied chiefly for the purpose of connecting the 4th section with the others.

Probable error of the Base.

There was another object in view (but secondary to the verification of the register), in the endeavour to select well conditioned triangles; viz.: to obtain an estimate of the probable error of the measurement of the Base, by comparing the sections with each other; or which amounts to the same thing;—to determine the distance between two points out of the line, from each section of the base. To perform this correctly, optical power equal to that employed for adjusting the dots of the point-carriers on the base, is required for centering the signals and theodolite over the stations: also the outlines of the signals should be well defined, and the line of sight should be free from the disturbance which occurs in the stratum of the atmosphere near the

§ 7. Probable error of the Base.

ground in dry weather and strong sunshine. Hence, since these circumstances cannot be commanded, a length determined by triangulation may, *a priori*, be regarded as not so accurate as one by direct measurement: on the other hand, the former is free from several small errors, particularly from those depending upon temperature and alignment. With respect to the latter it has been shewn (page 315) that the sum of the corrections for the deviation of the register pickets was very small; but it is not improbable that the deviation of intermediate points, whose positions could not be examined, may have been greater.

2. *Particulars relating to Signals and Stations.*

Signals.

The signals which were employed when triangulating the Base were of three kinds, viz.: *heliostats*, with screens and apertures of about one-tenth of an inch; *cylindrical poles*, painted black above and white below; and *white slits.*

The plan of the white slits was furnished by Captain Henderson; who stated that they had been found to answer well for short distances at the Loch Foyle Base. Each consisted of a triangular frame, four or five feet high, carrying two slips of thin sheet iron painted black, the adjacent edges separated ftom one to three inches, according to the distance of the station. Behind the slit thus formed, a board painted white is fixed at an angle of about 40° with the plane of the frame, for the purpose of reflecting light. A plumb-line bisecting the slit, centers it over the station point.

The image of the slit, as seen through a telescope, is a sharply defined white line on a black ground, perfectly free from phaze, and when the atmosphere is favourable the slit is as sharp and distinct as the bisecting wire. The only inconvenience attending this signal (of which there were six on the Zwartland Base) is the adjusting of its plane perpendicular to the line of sight, for each theodolite station, which must be done by an intelligent person,—not always available.

Each station out of the line was defined by a picket about three feet long and four inches diameter, driven firmly, and carrying a pin to define the point. Three other pickets were driven to support the theodolite trestle.

Station particulars.

East end, ⊙. A frame-slit signal. Well seen owing to the elevation of the station.

36382, ⊙. A frame-slit signal when observed from the east end, A and D: a pole when observed from B: an heliostat when observed from M and E. The signal in general flickering: and being somewhat masked by bush when observed from A, the top of the slit only could be seen.

A ⊙. A frame-slit signal. Definition good when observed from the east end, and ⊙ 36382; the reverse when observed from M. Signal twice overturned by cattle.

E, ⊙. A frame-slit signal when observed from the east end, 36382, and D: the first series from M an heliostat: from C a pole. Captain Henderson visited this station

when the theodolite was at M, and found the signal $1\frac{1}{2}$ inches excentric towards the west. Being an important point, the theodolite was taken again to M. The early observations are not so good as the subsequent, partly owing to bush which was cleared away when the latter were made. § 7. Station particulars.

D, ⊙. A frame-slit signal, projected on rising ground behind it. Invisible in strong sunshine, but well defined in the evening.

M, ⊙. A frame-slit signal when observed from D, 36382, A and B: an heliostat when observed from E: a pole from the other stations. The upper half only of the pole visible from Uyle Kraal. Returned to this station to observe Uyle Kraal, but the pole there, in the meantime, was thrown down by cattle, and the design was given up.

B, ⊙. A pole signal when observed from 36382: a frame-slit from A and M: a pole from the other stations. The signals overturned three times by cattle. Being on low ground the signal was not well seen from M, and there is evidence of the signals first set up, being excentric. A directing pole on the line near M was inadvertently observed for the one on C while at this station; the signals between B and G could not be seen from the Base-line.

C, ⊙. On arriving at this station with the theodolite, the signal was found to be a board, 4 inches in breadth, placed excentric: the distance between the half thickness of the board and station point was about two inches, and the distance seemed to coincide with M, C, prolonged. The theodolite was centered over the station point: a reduction is necessary for the angles with C, measured at E, G, and 23992. On leaving, a cylindrical pole was centered over the station point.

23992, ⊙. A frame-slit signal when observed from M: a pole from the other stations. Well observed from C.

G, ⊙. When the theodolite was at B, G signal was tilted to one side by cattle. On visiting the station to re-adjust, the signal was found to be a board similar to the one at C: the excentricity $1\frac{1}{2}$ inches in a direction parallel to the Base-line. The board was replaced by a cylindrical pole, centered over the station point. A reduction is necessary for the angle G M C. This station was well observed from C, M, and 9712: disturbed by cattle but re-adjusted, when observing from the west terminal point and K; returned to it to observe 9712 and K.

9712, ⊙. The signals over this and the subsequent stations were poles, and were relatively well observed: returned to it to observe K and 17797.

Uyle Kraal, ⊙. The signal pole was on the high ground, behind and to the west of the farm-house, and distant from it about 200 paces. The buildings cut off the view of the line eastwards of M, likewise of G. While occupying this station the sky was clouded and the signals steady.

K ⊙, and west end ⊙. Nothing worth recording.

17797, ⊙. This station is not visible from C, G, or the west end. Signal twice overturned, and not exactly vertical when observed from 9712; the lower end was observed.

§ 7. Corrections for level and temperature.

3. *Corrections for Level and Temperature.*

For the present purpose, the mean level of each section has been reduced to the level of the east terminal point. The following table exhibits these reductions, also the reduction to 62° of the six-inch brass standard, extracted from table III, page 334 :—

BASE-LINE.—TABLE IV.

No. of Section.	Depression below east end.	Reduction to east end.	Reduction to temperature 62°.	Sum of Reductions.	Measured lengths.	Lengths at temperature 62°, and at elevation of east end.
	feet.	feet.	feet.	feet.	feet.	feet.
1	33·29	+ ·0102	+ ·0188	+ ·0290	6436· 5	6436·5290
2	33·46	·0116	·0331	·0447	7245· 0	7245·0447
3	57·42	·0141	·0158	·0299	5145· 0	5145·0299
4			·0170	·0816	6195· 0	6195·0816
5	97·49	·0376	·0083	·0459	8085· 0	8085·0459
6	66·56	·0309	·0243	(*a*) ·0552	9712·25	9712·2971
3 & 4	84·90	·0787	·0328	·1115	11340· 0	11340·1115
5 & 6	80·61	+ ·0685	+ ·0326	+ ·1011	17797·25	17797·3430

4. *Observed Angles and Corrections for Errors of Observation.*

The following table gives the observed angles, the number of partial measures upon which each angle depends, the reciprocals of the weights, and the seconds of the angles corrected for calculation.

Weights of angular measures.

The weight of each angle was calculated by dividing the square of the number of partial measures by twice the sum of the squares of the differences from the mean, assuming the theodolite errors of division to be insensible, an assumption which is not strictly correct. The method pursued when measuring, of stepping the divided circle, eleminates the division errors from the mean result; they are restored in the weight as above calculated; but that factor cannot justly be represented by the number of measures *alone*,—where, as in the present instance, the triangulation is carried over flat ground,—the line of sight passing in close proximity to heated sand and bush, causing the signals to undulate so much, except during gloomy and moist weather, or early in the morning and late in the evening, as to materially diminish the precision of the pointing: it is therefore necessary to introduce this element of error.

The sum of the reciprocals of the weights of each triangle, having an angle at a central station has been employed for that angle when reducing the sum of the angles at the central station to 360° (*b*).

(*a*) The sixth section contains 40 series of 6 bars and 15 series of 4 bars, whose lengths exceed the same number of series of bars A, B, C, E, G by ·0081 foot, which subtracted from ·0552, leaves ·0471 for the sum of the reductions.

(*b*) On the meridian triangulation the errors are distributed by the laborious, but strict geometric process.

BASE-LINE.—TABLE V.

§ 7.

No. of Triangle.	NAMES OF STATIONS.	Observed Angles.	Number of Observations.	Reciprocals of the Weights.	Seconds Corrected.
		° ′ ″			″
1	East end of Base. A 36382	42·57·54·13 56·26·44·43 80·35·22·86	21 7 16	1·63 0·84 1·37	53·72 44·22 22·06
		+ 1·42		3·84	00·00
2	36382 A B	53· 2·40·13 82· 0·18·26 44·57· 1·03	12 8 15	3·53 3·96 1·65	40·25 18·58 1·17
		— 0·58		9·14	00·00
3	A M 36382	47·56·30·52 32·38·48·61 99·24·33·67	12 16 15	5·05 2·56 3·68	35·73 50·11 34·16
		— 7·20		11·29	00·00
4	M A B	35·23·31·03 34· 3·49·46 110·32·46·99	8 8 15	2·48 6·29 1·54	29·11 44·99 45·90
		+ 7·48		10·31	00·00
5	B M 36382	65·35·45·96 68· 2·19·60 46·21·53·42	18 20 12	1·45 1·59 4·08	46·87 19·22 53·91
		— 1·02		7·12	00·00
6	M G B	85· 1·51·57 28·47· 3·49 66·11· 0·76	19 17 14	1·49 1·99 1·62	52·61 5·21 2·18
		— 4·18		5·10	00·00
7	East end of Base. D 36382	75·45·50·62 47·37·41·29 56·36·25·51	20 19 14	2·85 1·60 1·96	52·08 42·12 25·80
		— 2·58		6·41	00·00
8	E D 36382	84·38·58·14 51·28·56·03 43·52· 3·01	13 19 14	1·82 1·67 4·33	59·09 56·91 4·00
		— 2·82		7·82	00·00
9	E M 36382	53·15·15·73 47·13·10·94 79·31·35·08	13 20 16	4·21 1·61 2·48	15·72 10·30 33·98
		+ 1·75		8·30	00·00

BASE-LINE —TABLE V—*cont.*

No. of Triangle.	NAMES OF STATIONS.	Observed Angles.	Number of Observations.	Reciprocals of the Weights.	Seconds Corrected.
		° ′ ″			″
10	C M E	58·56·11·86 60· 5·55·40 60·57·56·65	19 12 11	1·53 2·79 7·49	11·43 54·06 54·51
		+ 3·91		11·81	00·00
11	East end of Base. E 36382	40·29·25·73 39· 2· 1·71 100·28·28·96	15 12 16	1·21 3·01 2·09	26·52 3·68 29·80
		— 3·60		6·31	00·00
12	M 23992 C	72·41·51·63 74·14·10 50 33· 4· 3·10	10 10 22	3·04 2·69 1·74	49·35 8·71 1 94
		+ 5·23		7·47	00·00
13	M G C	99·36·44·24 35·41·31·51 44·41·44·86	24 17 20	1·08 1·56 1·44	43·81 31·42 44·77
		+ 0·61		4·08	00·00
14	G C K	56· 4·35·82 63·30·42·70 60·24·44·69	18 23 12	0·83 0·85 3·52	35·31 42·18 42·51
		+ 3·21		5·20	00·00
15	9712 West end of Base. K	103·14· 3·00 36·59·41·16 39·46· 9·88	24 10 16	1·73 2·12 0·79	4·91 44·11 10·98
		— 5·96		4·64	00·00
16	9712 G K	103·52 51·10 34·11·10·39 41·55·59·81	21 12 20	1·79 1·99 1·17	49·29 10·71 60·00
		+ 1·30		4·95	00·00
17	9712 K C	49·22 22·08 102·20·43·50 28·16·57·71	5 5 13	2·61 0·24 1·33	19·83 43·34 56·83
		+ 3·29		4·18	00·00
18	G C 9712	90·15·48·75 35·13·43·00 54·30·30·39	14 11 17	1·33 3·68 1·89	48·43 42·11 29·46
		+ 2·14		6·90	00·00

No. of Triangle.	NAMES OF STATIONS.	Observed Angles.	Number of Observations.	Reciprocals of the Weights.	Seconds Corrected.
		° ′ ″			″
19	9712 K 17797	76·45·50·24 47·12·44·84 56· 1·30·33	20 22 7	1·74 0·70 1·50	47·96 43·84 28·20
		+ 5·41		3·94	00·00
20	K 17797 West end of Base.	86·58·54·86 56· 1·24·51 36·59·39·45	16 7 10	0·81 1·50 2·12	
		− 1·18		4·43	
21	9712 West end of Base. Uyle Kraal.	93·16·28·71 58· 4· 9·22 28·39·22·40	24 14 25	1·36 3·52 1·13	28·84 8·87 22·29
		+ 0·33		6·01	00·00
22	9712 Uyle Kraal. 17797	86·43·24·08 25·45·41·33 67·30·55·54	25 23 11	2·19 1·33 3·96	24·03 41·10 54·87
		+ 0·95		7·48	00·00
23	G K West end of Base.	46·58· 9·26 81·42·10·21 51·19·36·31	8 15 14	5·27 1·57 1·49	
		− 4·22		8·33	
24	Uyle Kraal. 9712 M*	50·20·34·32 86·43· 4·73 62·56·20·95	11 5		

* Not measured.

5. *Comparison of the several Sections of the Base with the first.*

The following table exhibits the calculation of the lengths of the sections (excepting the 4th) from the first section as a base, through the chain of triangles to the north of the line,—the best conditioned and the best measured. The undulations of the ground disconnected the chain at the 4th section, but that section has been included with others in a way to verify its length.

BASE-LINE.—TABLE VI.

No. of Triangle.	NAMES OF STATIONS.	Angles.	Log Sines.	Log Sides.	Sides in feet: computed.	Sides in feet: measured.
	D	47·37·42·12	9·8685204	3·8086517		Section 1 =
7	36382	56·36·25·80	9·9216431	3·8617744		6436·529
	East end of Base.	75·45·52·08	9·9864550	3·9265863		
	E	84·38·59·09	9·9981038			
8	36382	43·52· 4·00	9·8407310	3·7692135		
	D	51·28·56·91	9·8934386	3·8219211		
	M	47·13·10·30	9·8656732			Section 2
9	E	53·15·15·72	9·9037949	3·8600428	7245·073	7245·045
	36382	79·31·33·98	9·9927028	3·9489507		
	C	58·56·11·43	9·9327761			
10	M	60· 5·54·06	9·9379602	3·9541348		
	E	60·57·54·51	9·9416727	3·9578473		
	23992	74·14· 8·71	9·9833500			
12	M	72·41·49·35	9·9798876	3·9543849		Section 3
	C	33· 4· 1·94	9·7368922	3·7113895	5145·050	5145·030
	G	35·41·31·42	9·7659878	3·9578473		
13	C	44·41·44·77	9·8471667	4·0390262		
	M	99·36·43·81	9·9938596	4·1857191		
	K	60·24·42·51	9·9393179			
14	G	56· 4·35·31	9·9189646	4·1653658	14634·091	
	C	63·30·42·18	9·9518355	4·1982367		
	West end of Base.	51·19·37·06	9·8924978			
23	K	81·42·11·01	9·9954305	4·3011694		
	G	46·58·11·93	9·8639152	4·1696541		
	17797	56· 1·24·91	9·9186948			Section 5 and 6
20	K	86·58·55·08	9·9993972	4·2503565	17797·398	17797·343
	West end of Base.	36·59·40·01	9·7794071	4·0303664		
	9712	76·45·47·96	9·9883059			Section 5
19	K	47·12·43·84	9·8656217	3·9076822	8085·040	8085·046
	17797	56· 1·28·20	9·9186994	3·9607599		
	West end of Base.	36·59·44·11	9·7794186			
15	9712	103·14· 4·91	9·9883093	4·1696506		Section 6
	K	39·46·10·98	9·8059788	3·9873201	9712·256	9712·297
	Uyle Kraal.	28·39·22·29	9·6808363			
21	9712	93·16·28·84	9·9992903	4·3057741		
	West end of Base.	58· 4· 8·87	9·9287474	4·2352312		
	17797	67·30·54·87	9·9656632			
22	9712	86·43·24·03	9·9992894	4·2688574		Section 5
	Uyle Kraal.	25·45·41·10	9·6381144	3·9076824	8085·044	8085·046
	M*	42·56·20·96	9·8332882	4·2352312		
24	9712	86·43· 4·72	9·9992871	4·4012301		Sections 3, 4, & 5
	Uyle Kraal.	50·20·34·32	9·8864215	4·2883645	19425·156	19425·157

* This angle was not measured.

The following results are deduced from the foregoing table :— § 7.

Comparison of the calculated with the measured Sections.

	Measured.	Calculated.	Differences.
	feet.	feet.	foot.
Section 1 =	6436·529	Base.	
2 =	7245·045	7245·060	− ·015
3 =	5145·030	5145·050	− ·020
5 & 6 =	17797·343	17797·398	− ·055
5 =	8085·046	8085·042	+ ·004
6 =	9712·297	9712·256	+ ·041
3, 4 & 5 =	19425·157	19425·156	+ ·001

The comparison of sections 3, 4, and 5 are effected by means of a triangle, of which two angles only were measured: but another combination is deduced by calculating the side C—K of the triangle C, G, K (*a*), from each of the other five sections, as follows:

The mean of the five determinations of C—K is 14634·036 feet [4·1653642]; which gives [4·0390246] and [4·3011678] for the logarithms of the sides M—G, and west end of Base—G; of the triangle M, G, west end. With these two sides, and the included angle at G (138°·44′·18″·66), the sum of the sections 3, 4, 5, and 6, is 29137·595, the measured length is 29137·455.

6. *Calculation of the side C—K, of the triangle C G K, from the several sections of the Base, excepting the 4th.*

BASE-LINE.—TABLE VII.

Calculation of the probable error of the Base.

No. of Triangle.	NAMES OF STATIONS.	Angles.	Log Sines.	Log Sides.	C—K.	Section.
		° ′ ″			feet.	Section 2 = 7245·045
9	E M 36382	53·15·15·72 47·13·10·30 79·31·33·98	9·9037949 9·8656732 9·9927028	3·8600411 3·8219194 3·9489490		
10	C M E	58·56·11·43 60· 5 54·06 60·57·54·51	9·9327761 9·9379602 9·9416727	 3·9541331 3·9578456		
13	G C M	35·41·31·42 44·41·44·77 99·36·43·81	9·7659878 9·8471667 9·9938596	 4·0390245 4·1857174		
14	K C G	60·24·42·51 63·30·42·18 56· 4·35·31	9·9393179 9·9518355 9·9189646	 4·1982350 4·1653641	 14634·034	

(*a*) See the following table.

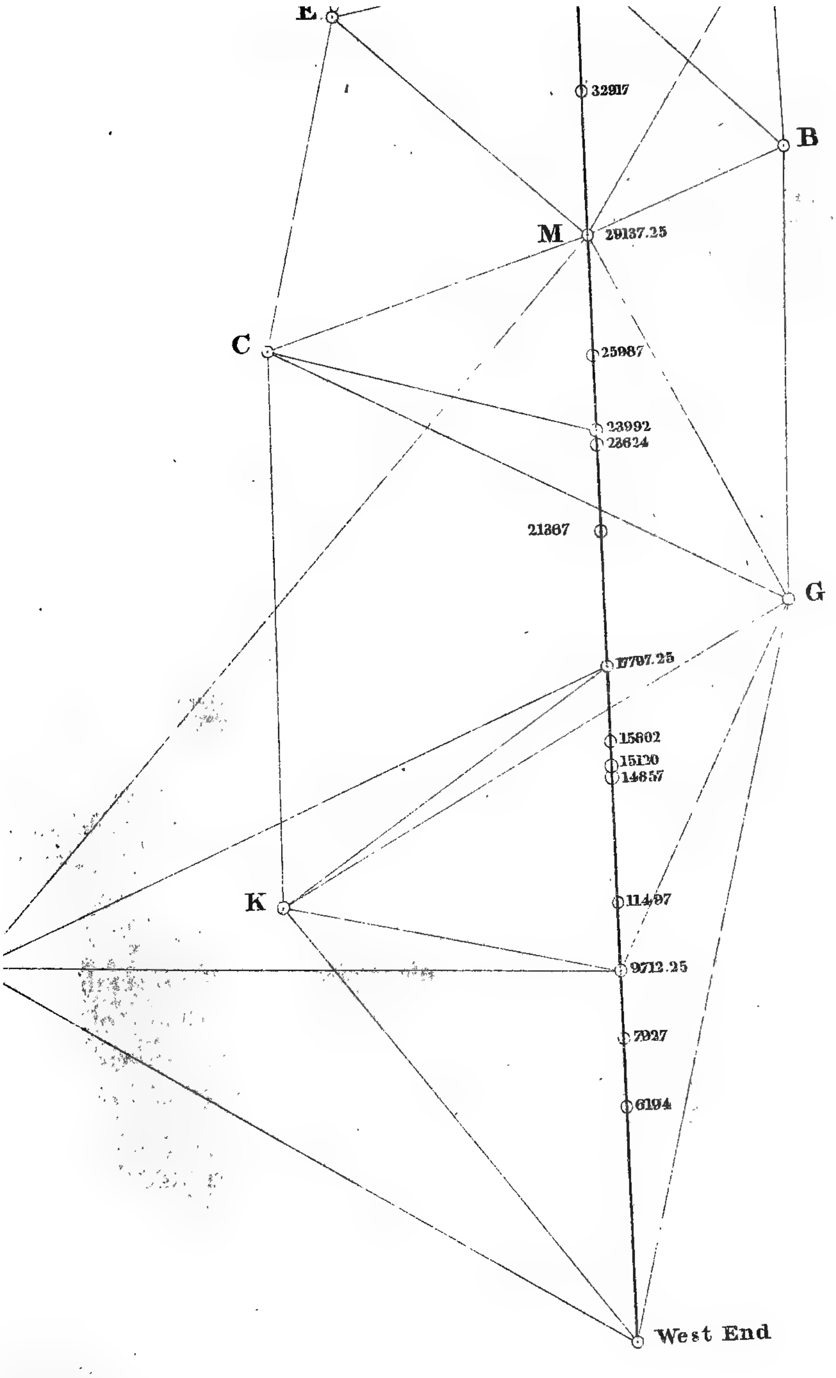
BASE-LINE.—TABLE VII—*cont.*

§ 7. Calculation of the probable error of the Base.

No. of Triangle.	NAMES OF STATIONS.	Angles.	Log Sines.	Log Sides.	C—K.	Section.
		° ′ ″			feet.	Section 3
12	C M 23992	34· 4· 1·94 72·41·49·35 74·14· 8·71	9·7368922 9·9798876 9·9833500	3·7113879 3·9543833 3·9578457		5145·030
13	G C M	35·41·31·42 44·41·44·77 99·36·43·81	9·7659878 9·8471667 9·9938596	 4·0390246 4·1857175		
14	K C G	60·24·42·51 63·30·42·18 56· 4·35·31	9·9393179 9·9518355 9·9189646	 4·1982351 4·1653642	 14634·037	
19	K 9712 17797	47·12·43·84 76·45·47·96 56· 1·28·20	9·8656217 9·9883059 9·9186994	3·9076825 4·0303667 3·9607602		8085·046 Section 5
15	West end of Base. K 9712	36·59·44·11 39·46·10·98 103·14· 4·91	9·7794186 9·8059788 9·9883093	 3·9873204 4·1696509		
23	G K West end of Base.	46·58·11·93 81·42·11·01 51·19·37·06	9·8639152 9·9954305 9·8924978	 4·3011662 4·1982335		
14	C K G	63·30·42·18 60·24·42·51 56· 4·35·31	9·9518355 9·9393179 9·9189646	 4·1857159 4·1653626	 14633·983	
15	K West end of Base. 9712	39·46·10·98 36·59·44·11 103·14· 4·91	9·8059788 9·7794186 9·9883093	3·9873220 3·9607618 4·1696525		9712·297 Section 6
23	G K West end of Base.	46·58·11·93 81·42·11·01 51·19·37·06	9·8639152 9·9954305 9·8924978	 4·3011678 4·1982351		
14	C K G	63·30·42·18 60·24·42·51 56· 4·35·31	9·9518355 9·9393179 9·9189646	 4·1857175 4·1653642	 14634·037	

C—K from Section 1 has already been calculated. (No. 14, page 342).

It will be remarked, that the last decimal place of the several values of C—K cannot be correctly taken from tables to seven places only. (Tables of greater depth are not available at the Cape). The result, however, would be little altered by confining the calculation to the nearest hundredth of a foot. It will also be remarked that the frequent repetition of the same triangle C G K might have been dispensed with, by taking the difference of the logarithms. But it is better to spare a little space, than to not exhibit the calculation in the usual form.



E
32917
B
M
29137.25
C
25987
23992
23624
21367
G
17707.25
15802
15120
14857
K
11407
9712.25
7927
6194
West End

ge 385.

Verification and Extension of La Caille's Arc of Meridian.

Plans of Bradley's Zenith Sector.

Fig. 1. Side view of the top of the great spindle &c.

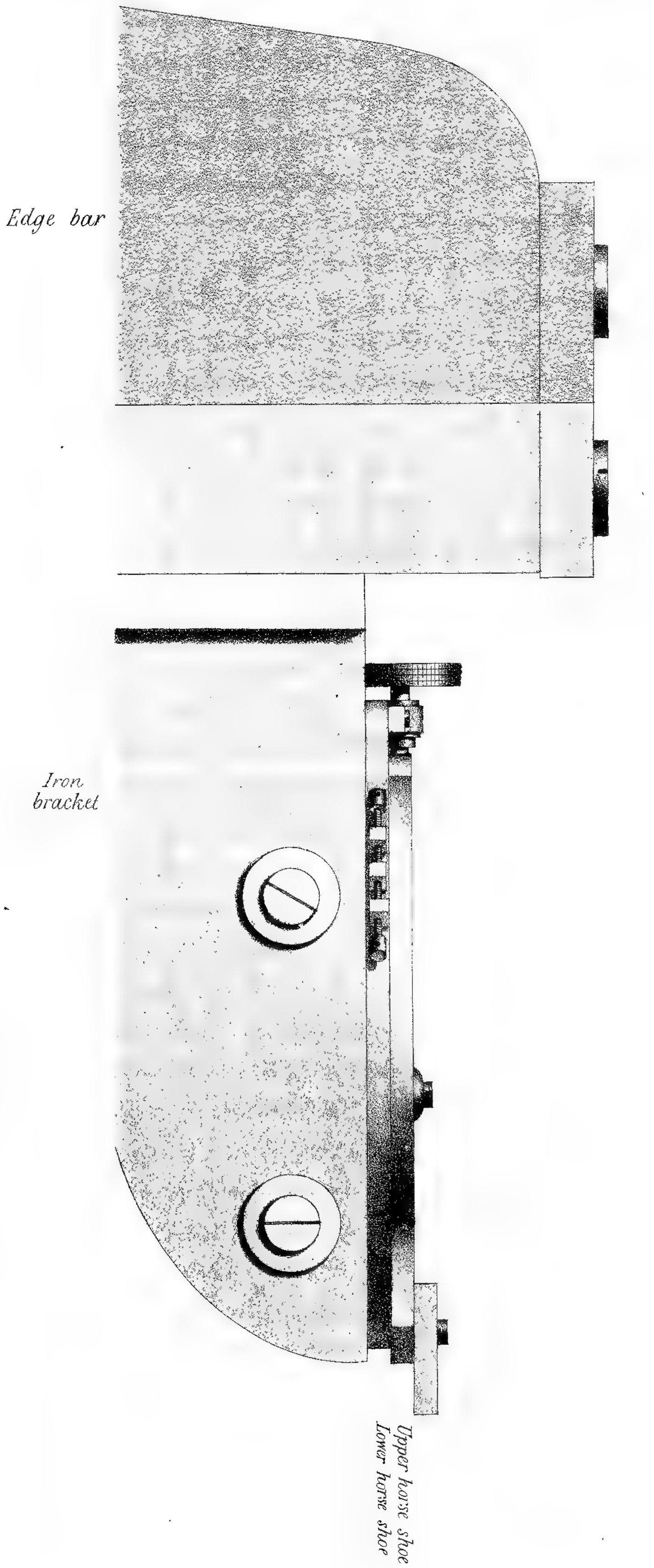
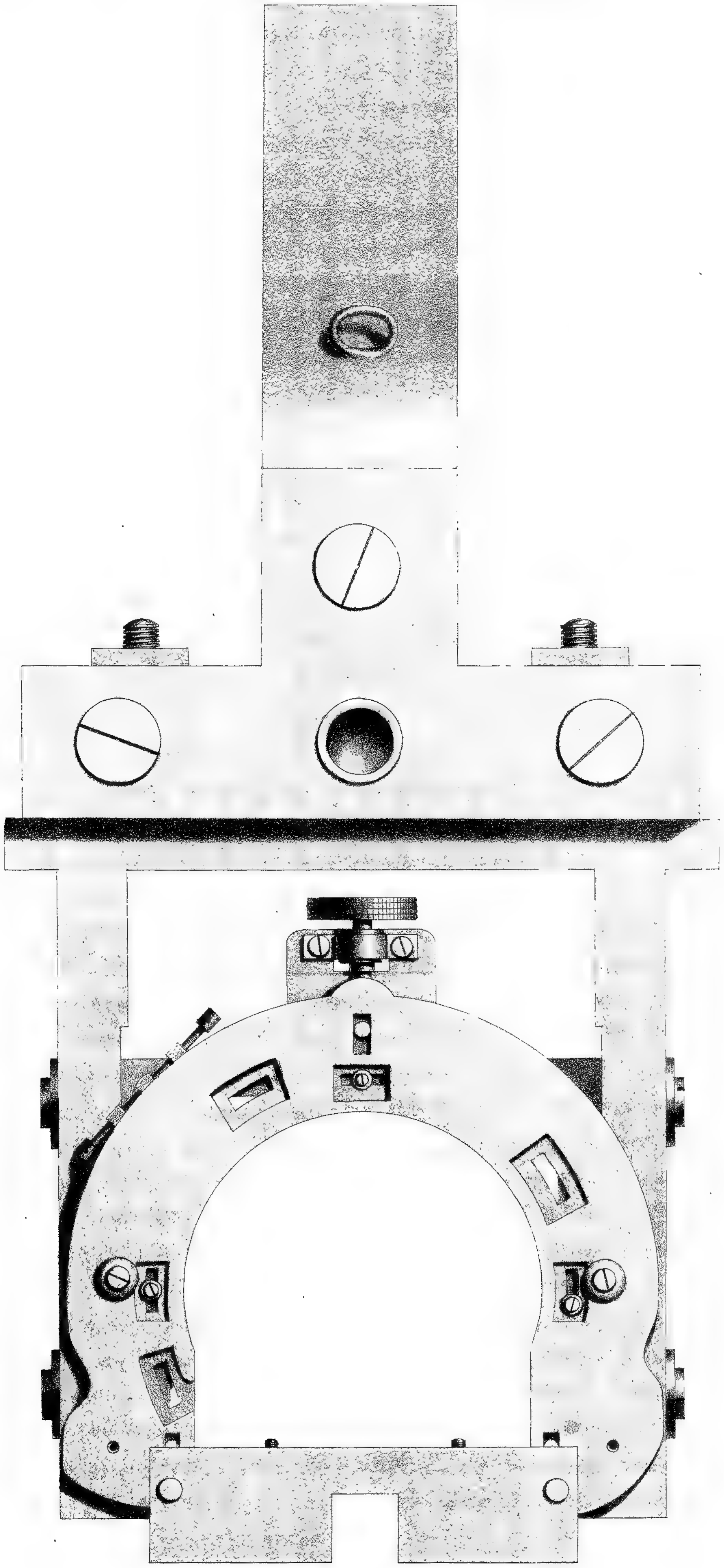


Fig. 2. End view of the top of the great spindle &c.



SCALE of INCHES.

1 2 3 4 5 6 7 8

J. Basire lith.

Verification and Extension of La Caille's Arc of Meridian.

Plans of Bradleys Zenith Sector.

Fig. 3.

View of the triangular frame which rests upon the upper horse shoe and supports the pivots of the telescope.

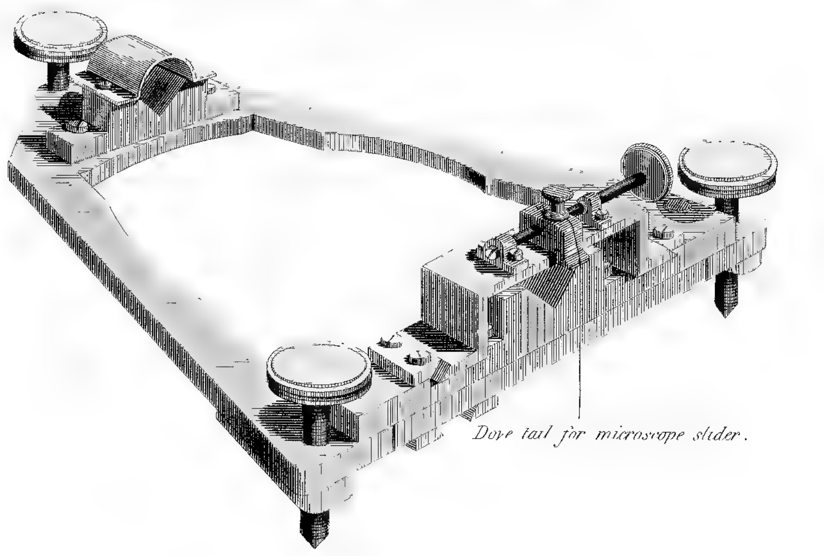


Fig. 4.

Plan of the triangular frame.

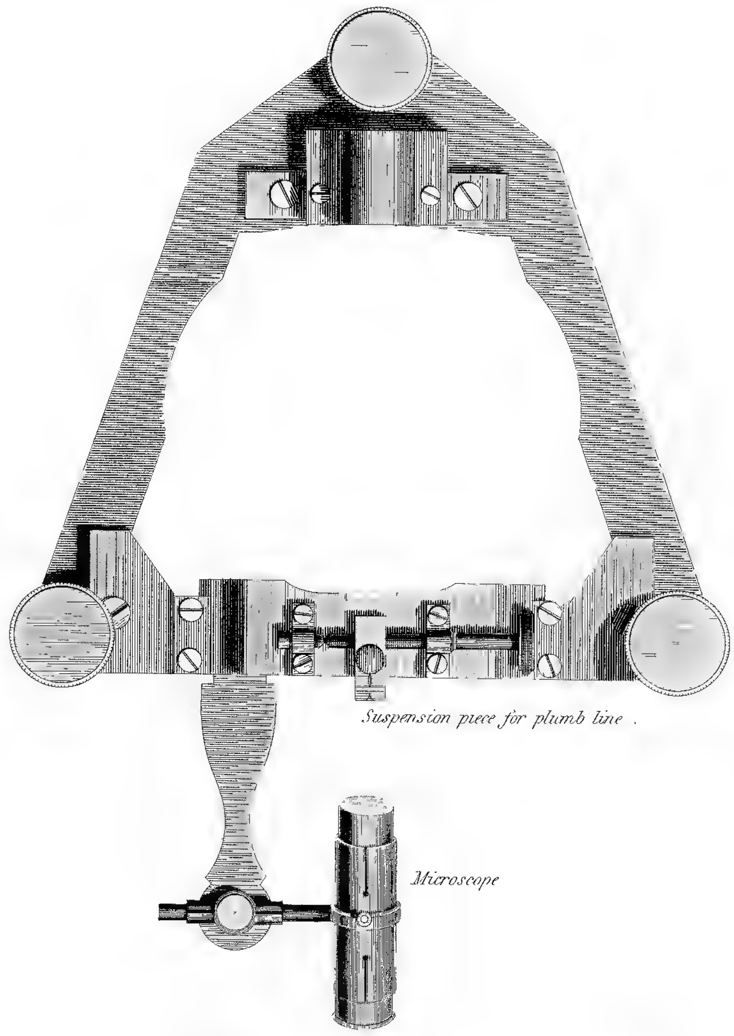
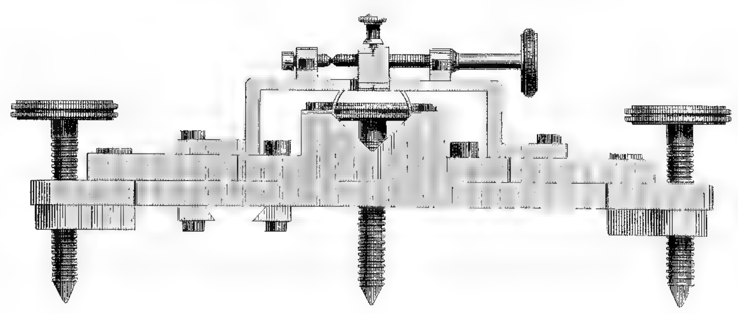


Fig. 5.

Front view of the triangular frame.



SCALE OF INCHES.

1 2 3 4 5 6 7 8 9

Verification and Extension of La Caille's Arc of Meridian

Plans of Bradley's Zenith Sector

Fig 12 Side View of eye piece cell

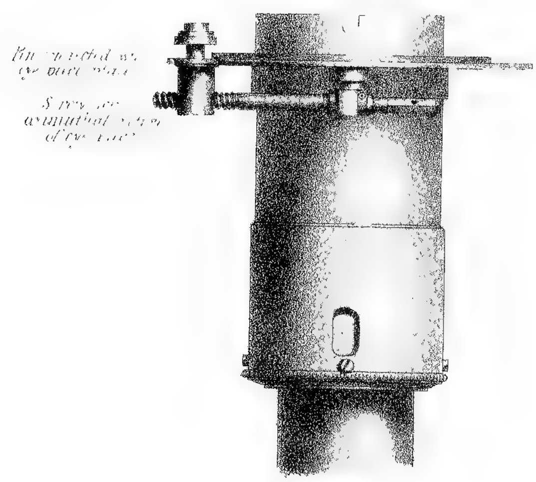
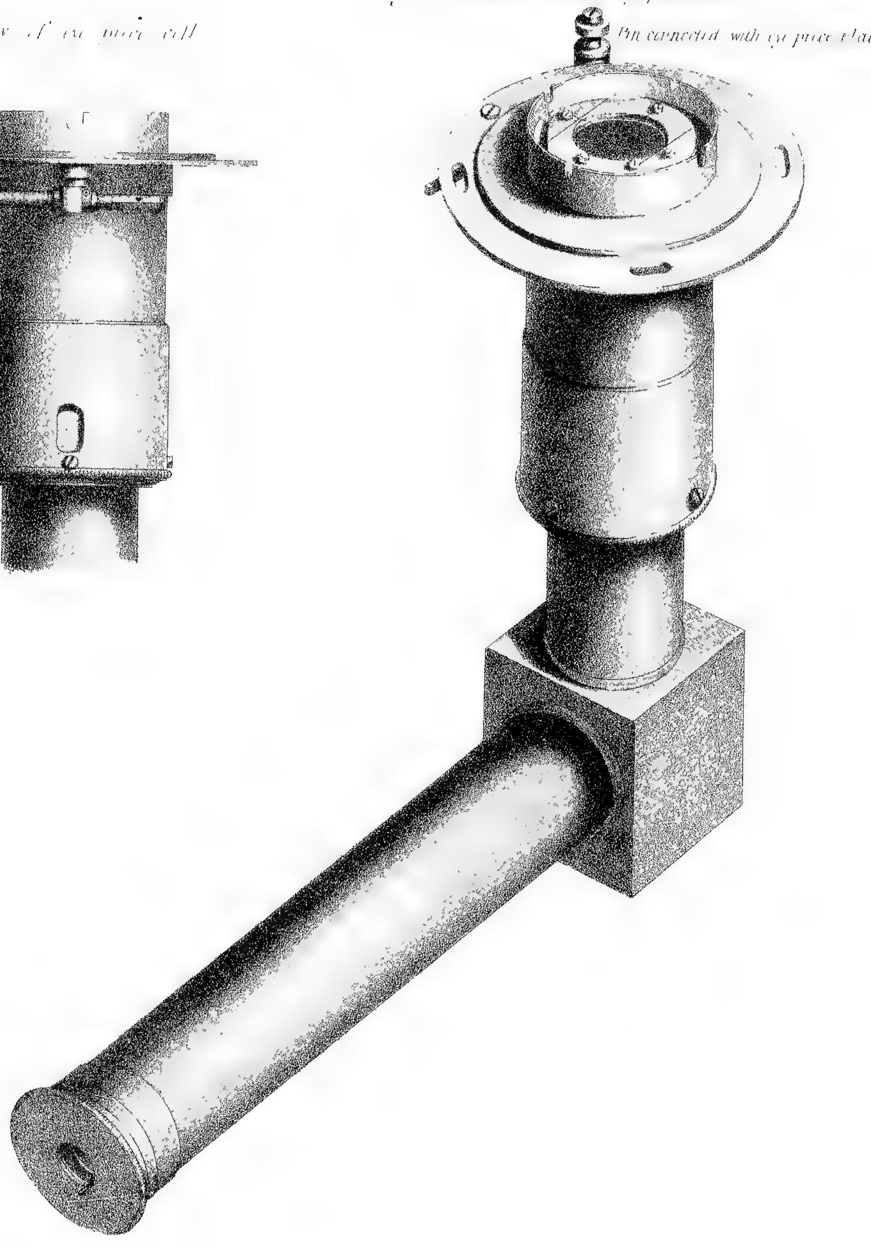


Fig 13 Perspective view of eye piece cell.



SCALE of INCHES

Verification and Extension of La Caille's Arc of Meridian

Plans of Bradley's Zenith Sector.

Fig. 14. View of roller frame

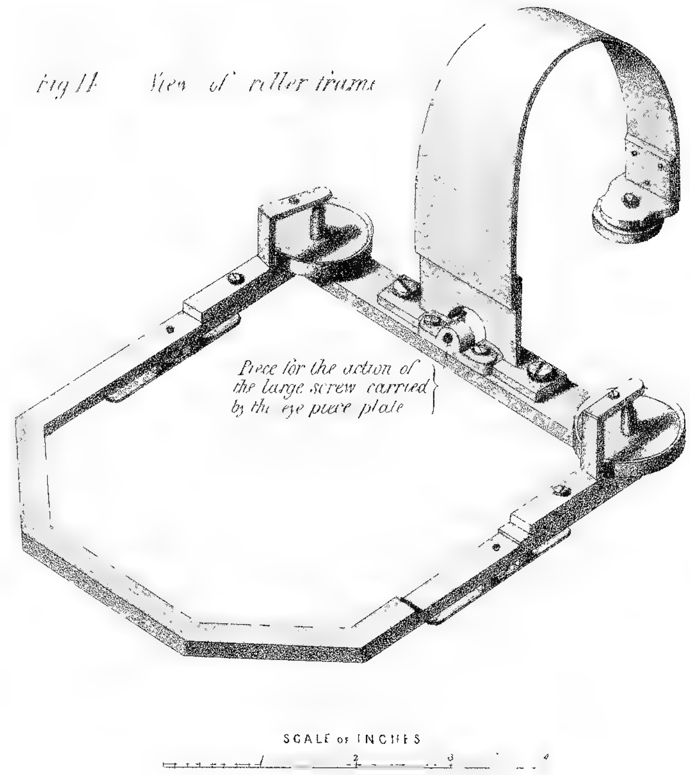


Fig. 15. View of eye-piece plate, sector arc,
eye piece cell and roller frame; as connected

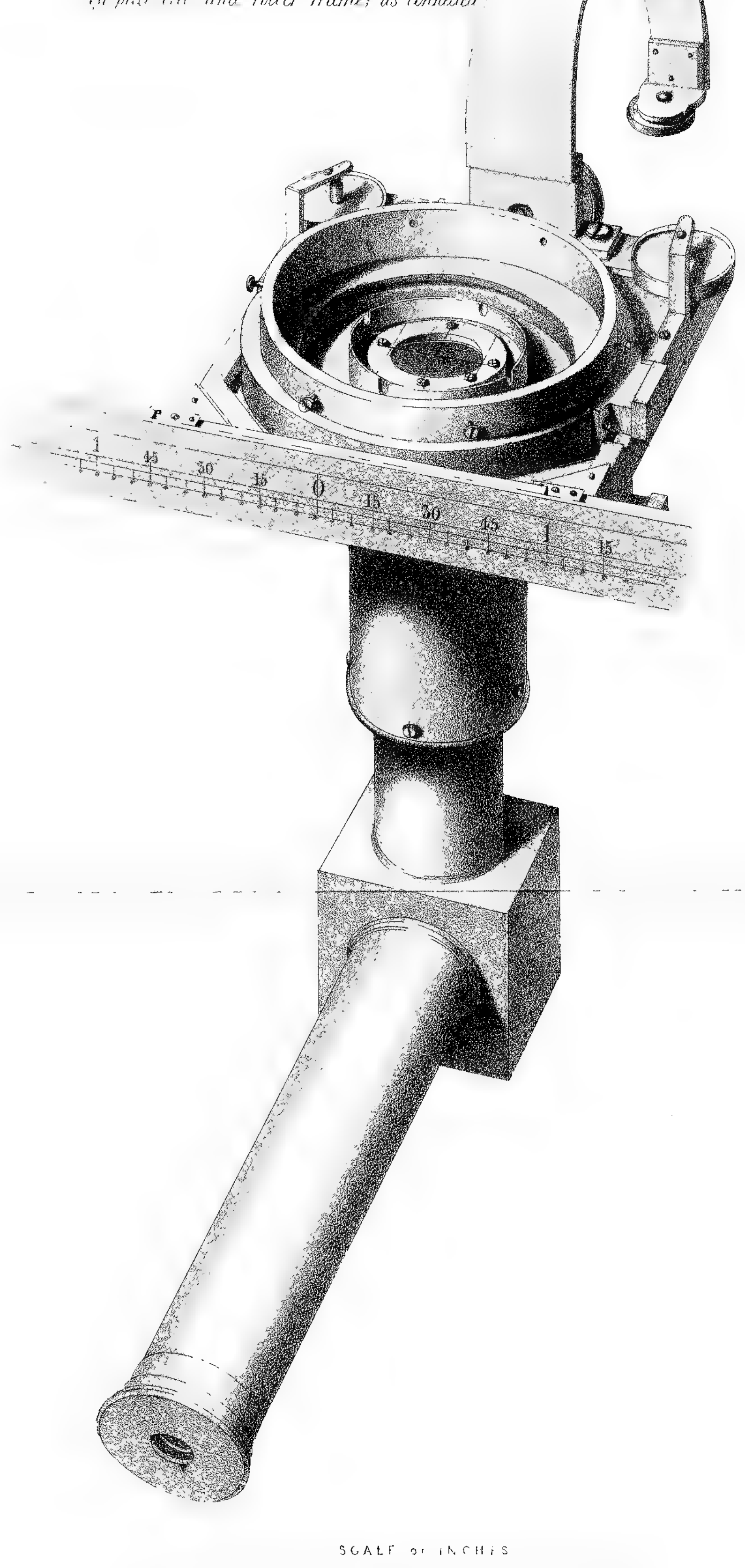
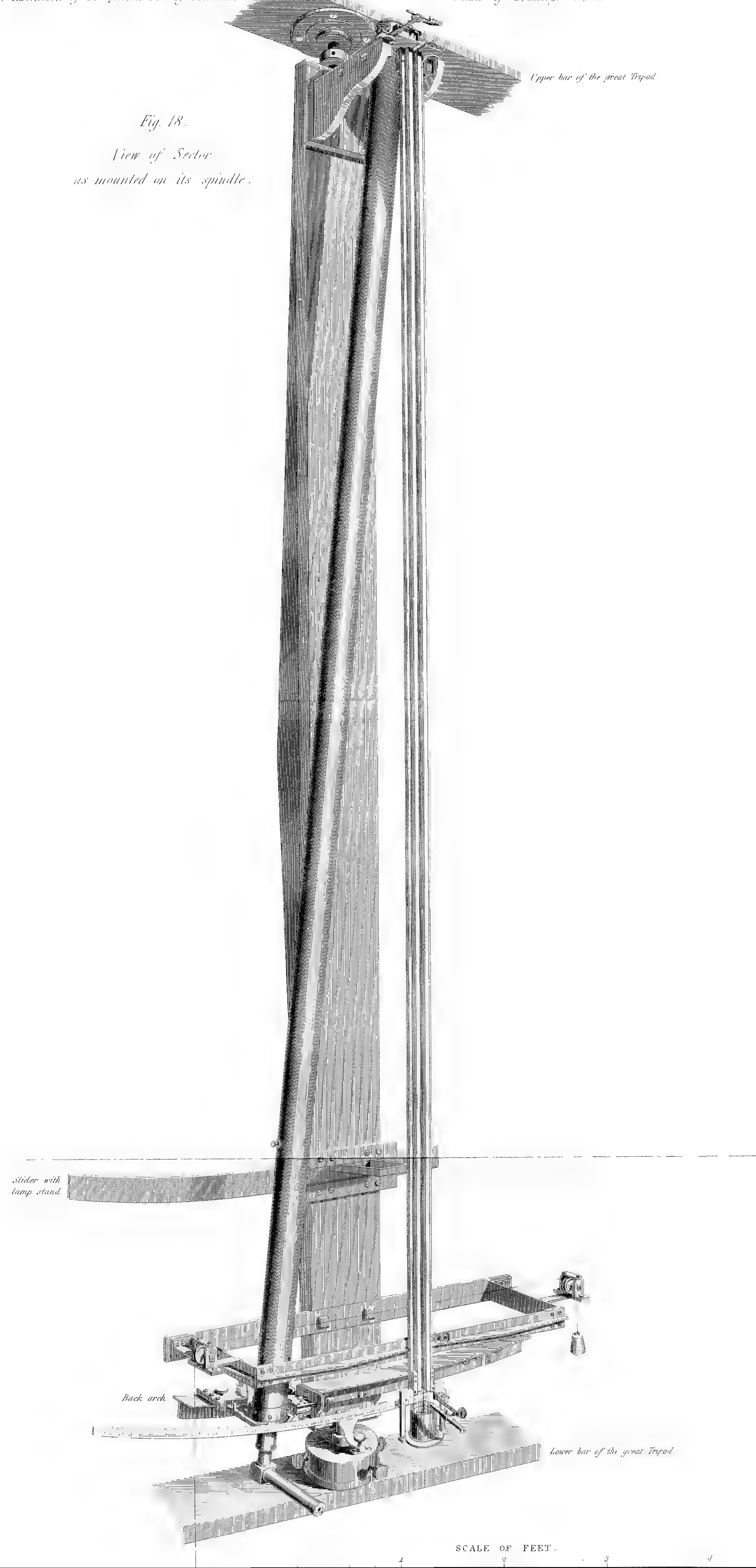


Fig. 18.

View of Sector
as mounted on its spindle.



§ 7. Calculation of the probable error of the Base.

The weight given to each determination of C—K, is the fraction whose numerator is the length of the section from which the determination is deduced; and the denominator the sum of the sections. Section 4 has been omitted, because it cannot be calculated independently.

Section.	Calculated lengths.	Weights.	Products.	Differences.	Squares of differences.
	feet.				
1	14634·091	·176	·0160	·057	·00325
2	14634·034	·198	·0067	·000	·00000
3	14634·037	·140	·0052	·003	·00001
5	14633·983	·221	·0038	·051	·00260
6	14634·037	·265	·0098	·003	·00001
		1·000	·0339		·00587

$$\sqrt{\frac{\cdot 00587 \times \cdot 454936}{5^2 - 5}} = \cdot 0115 \text{ foot} = \cdot 138 \text{ inch.}$$

The length of C—K is therefore 14634·034 feet, with a probable error of $\pm \cdot 14$ inch, equivalent to ·41 inch on the length of the Base.

This result is meant to shew that the error of measurement is small, rather than the exact numerical value of the probable error: for a small, yet plausible, alteration in the distribution of the theodolite work errors would alter the numbers. Upon the whole, however, so far as it may be worth consideration, the triangulation of the Zwartland Base contributes to the increase of confidence in compensation bar measurement. The labour of the measurement is another matter:—the trial to the eyes of so many optical adjustments, when the summer sun is strong and the heat great, can only be appreciated by experiment. Yet there is a variety in carrying out the details of actual measurement, which relieves, and for which there is no substitute in the comparisons of the measuring bars *inter se*, and with the standard. Here there is a constant strain of mind and eye in search of accordant results, baffled by ever varying temperature, which disheartens and depresses. But these personal considerations dwindle to nothing, in comparison with the degree of accuracy which Colby's compensation apparatus appears to be capable of affording.

§ 8.

§ 8. Comparisons of the Compensation Bars with the Standard Iron Bars.

1. *Particulars relating to the arrangements.*

The first experiments for obtaining the relative lengths of the compensation and standard bars were made under the zenith-sector tent, in the Observatory grounds, where two ancient pillars of brick masonry stand, which by chance are 10 feet apart. Stones were let into these pillars for carrying the microscopes, but the results from a few experiments proving unsatisfactory, the microscope stones were removed from the pillars, and fixed in the east wall of the telescope room. This room having a southern aspect, and an area of nearly 28 × 23 feet, preserves a pretty uniform temperature; but a block of masonry disconnected from the boarded floor, for supporting the bars, could not be built up from the foundation underneath, before the arrival of the time for removing the instruments to Zwartland.

Immediately after deciding upon the direction of the Base-line; a barn near the west end was hired of the Koekoek farmer, wherein two pillars were built of stone and lime masonry, to carry the Ordnance microscopes. Between this spot and the east end of the line, there was no house or hut of any description, excepting the Coggera farm, distant about three miles,—and Buckle's farm, distant about four miles from Coggera; and neither of these within a convenient distance from the line.

Early experience had shown that no ordinary canvass covering would be a sufficient protection against rapid temperature changes; also that the time absorbed in conveying the bars to fixed microscopes, and comparing them there, would seriously retard the measurement of the line. To meet the first as far as practicable, it was proposed to sink pits and cover them with bush; and the last by a microscopic beam compass, if it could be made sufficiently stiff to slide along a smooth surface, without sensible flexure, so that the microscopes might be brought in quick succession over the several bars resting on their camels.

Microscopic beam compass and comparison sheds.

Accordingly, the Cape micrometer microscopes A and B were attached to trussed arms, projecting from a trussed plank of well-seasoned pine (saturated with oil), 3 inches thick and 9 inches in depth, having foot pieces at right angles to the plank, which rested upon a quadrilateral frame of pine, of the same thickness and depth of material; and of dimensions sufficient to enclose the standard iron bar B, and the five compensation bars. The upper surface of the side pieces of the frame, and the lower of the foot pieces, were planed true and smooth, and polished with black lead; so that by slight force, applied in the proper direction to the ends of the foot pieces, the beam could be slided along.

The frame rested upon a ledge cut in the bank of the pit, wherein spare trestles were placed to carry the bars. Over the pit a shed was constructed of bush and canvass, to screen the interior from the sun and weather.

§ 8. Microscopic beam compass and comparison sheds.

The first comparisons by the agency of this apparatus were discordant, the chief cause of which was traced to lateral contact of the frame guide-flanches with the foot pieces; the flanches were therefore removed: still the residual discrepancies were at times sufficient to create a doubt of the efficiency of the apparatus, until experiments were made under a shed where the microscopes were attached to stone piers, when it was found that a portion of them were due to change of temperature during the comparisons, although the time required for making the comparisons had been materially diminished.

Three pit sheds were constructed for the beam compass (numbered consecutively 1, 2, 3) at 12127, 19897, and 25500 feet, reckoning from the west end of the Base.

Stone pillars.

In the middle of February, stone pillars were erected near the point M (plan of the triangulation, page 335); and early in March, at a point rather more than half way between M and the east end of the line (the shed covering like the former, consisting of bush): hence, including the barn, there were six sheds along the line for comparing bars.

Arrangements for comparing bars at the Observatory.

On the return of the apparatus to the Royal Observatory, arrangements were made for determining, with all practicable accuracy, the relative lengths of the two iron standards and the five compensation bars. In the telescope room before mentioned, and under the microscope stones projecting from the east wall, rather more than 8 × 4 feet of the boarded floor was cut out, to allow of a solid block of masonry, topped with flag stones, being built up to its level from the foundation without touching it; and upon this firm and independent bearing was placed a strong and well-braced frame of pine-wood, with a sliding board and appliances for the camels.

Considering the dimensions and position of the room, a better for the purpose could scarcely be found above ground, excepting the exposure of the east wall to the morning sun: the experiments, however, were made between the 19th of August and 9th of September, when the action of the sun at the Cape is comparatively weak.

2. *Runs of the Cape Micrometer Microscopes A and B, and of the Ordnance Micrometer Microscope.*

Alteration of runs of A and B.

The runs of the microscopes A and B were not altered between the 14th of August, 1840 (the date when they were first used), and the 23rd of February, 1841, when the object glasses were moved to bring the runs into closer coincidence with each other. The runs were again altered on the 4th of March, 1841, in shed No. 5, after which the object glasses were not disturbed.

The whole of the comparisons between the compensation and standard bars were made with these microscopes, except those in the barn at Koekoek Valei, during the interval between the 14th of October and the 16th of December, 1840, which were made

§ 8. Ordnance microscopes. with two microscopes belonging to the compensation bars; one furnished with a micrometer, and the other with a fixed wire.

Reference scale. The four feet brass scale by Dollond, divided to inches and tenths of inches by lines, was used for converting the revolutions of the several micrometer microscopes into fractions of an inch. The late Mr. Frances Baily compared this scale with the Royal Astronomical Society's, in the year 1839; and found its total length equal to 47·997083 standard inches of that scale. The subdivisions were not examined. The scale was unfortunately placed on the base-line, in the way of a waggon wheel (page 243), which broke the case and curved the scale near its middle, leaving the distance on each side uninjured.

Examination of its divisions 0—6 inches. Assuming the six inches, from 0 to 6, to be the 8th part of the scale; it became expedient to examine how far each subdivision could be taken as the 60th part of the six inches, and the relation of this 60th part, or the mean tenth of an inch, to the tenths which had been used for the runs.

The first examination was made in shed No. 5, on the 22nd of April, 1841, by comparing each tenth in terms of microscopes A and B, when the results appeared as follows:—

Microscope A.—Mean 0·1 inch = 20·0315 rev., temperature 66·59° = 20·0303 rev., temperature 62°.
„ B.—Mean 0·1 inch = 19·9429 rev., temperature 74·98° = 19·9402 rev., temperature 62°.

Hence in temperature 62°, 1 rev. of A = ·0049924 inch.
1 of B = ·0050150 inch.

The second examination was made in the telescope-room of the Royal Observatory, on the 22nd and 23rd of February, 1844, no intentional alteration of the runs having been made in the interim:—

Microscope A.—Mean 0·1 inch = 19·9681 rev., temperature 76·10° = 19·9651 rev., temperature 62°.
„ B.—Mean 0·1 inch = 19·8534 rev., temperature 73·18° = 19·8511 rev., temperature 62°.

Hence, 1 rev. in temperature 62° of A = ·0050087 inch.
„ B = ·0050375 inch.

12·0—12·1 inches. On the same occasion, Mr. Mann examined the micrometer value of 12·0—12·1 inches, as follows:—

Microscope A.—12·0—12·1 inch = 20·0089 rev., temperature 76·98° = 20·0058 rev., temperature 62°.
B.—12·0—12·1 inch = 19·9262 rev., temperature 76·93° = 19·9231 rev., temperature 62°.

This interval, therefore, exceeds the mean 0·1 inch, by ·0002832 = 0·0564 rev.

Value of the mean 0·1 of the first inch, and of the first two inches. From the several examinations of the first six inches; the mean 0·1 of the first inch, and the mean 0·1 of the first two inches are less, respectively, by ·0000336 and ·0000108 inch, than the mean 0·1 of the first six inches taken as the standard.

In shed No. 4, on the 22nd of February, 1841, two fine dots were made on the 6-inch brass standard, in the position with respect to the engraving upon it, thus— § 8. Dots on the 6-inch Standard.

dots. "Standard at 62° Fahrenheit."

The interval between them was measured by Captain Henderson, Mr. Maclear, and Mr. Smyth, and the mean results were in terms of

Microscope A, 18·692 rev.
„ B, 18·375.

On the following day, and after the alteration of the runs,

Microscope A, 18·570 rev.
„ B, 18·596.

Again, with great care at the Royal Observatory, in February, 1844:

A, 18·9154 rev., temperature 78·63° = 18·9121 rev.
B, 18·7966, „ 76·05 = 18·7938 } temperature 62°.

which gave for the length of the interval, in terms of the mean 0·1 inch, ·0946997 inch.

These dots were occasionally referred to in the latter part of the operation, for detecting any variation of the runs: but although more delicate, they were not so convenient nor so generally employed for the same purpose, as two lines which were drawn on each of the gold studs of the 10-feet standard. Lines on gold studs of Standard.

August, 1840, the scale division was 12·0—12·1 inches. Runs of microscopes employed in the reductions.

Microscope A, 19·9113 rev., temperature 71·90° = 19·9092 rev.
„ B, 19·5820, „ 71·95 = 19·5800 } temperature 62°.

But this division exceeds the mean 0·1 inch by ·0002832; the run of

A therefore becomes 19·8528 rev.
of B „ „ 19·5245.

which values have been used in the reductions prior to February 23, 1841.

Feb. 23.	Microscope B.—Mean of	10	measures over the first inch		= 19·6391 rev.
	„	20	„	„ first two inches	= 16·5328
	„	5	„	over 12·0—12·1	= 19·7176
	„	3	„	„ 12·0—12·1	= 19·6089

The mean of these determinations, in terms of the mean 0·1 inch, is 19·5822 rev.

By the dots on the 6-inch standard, the run of

$$\text{Microscope A} = \frac{18\cdot570 \times 19\cdot5822}{18\cdot596} = 19\cdot5548 \text{ rev.};$$

which values, viz.: 19·5822 rev. and 19·5548 rev., have been used in the reductions from February 23 to March 4.

§ 8. Runs of Microscopes employed in the reductions.

After March 4, the runs deduced from the examination of the mean 0·1 inch of the first six inches, effected on the 22nd and 23rd of April, has been used; — viz.:

Microscope A, 20·0303 rev.
„ B, 19·9402.

Run of Ordnance microscope.

On the 13th and 15th of October, 1840, the scale division was 12·0—12·1 inches, and the run over it reduced to 62° = 20·6065 rev. Subtracting 0·0584 rev. for the excess of that division over the mean 0·1 inch, the run becomes 20·5481 rev.; which value has been used for the comparisons made with the Ordnance microscope, in the barn at Koekoek Valei, between October 14 and November 30.

It is unnecessary to give at full length the details of the partial experiments upon which the foregoing determinations are founded.

For arithmetical convenience in the reduction of the comparisons of the bars, the microscope readings were corrected to what they would have been if 20 *revolutions of the screw had been exactly equal to* 0·1 *inch, or one revolution* = ·005 *inch.*

3. *Expansion of the Cape* 10-*feet Iron Bars A and B.*

Experiments in London: on the expansion of iron bars A and B.

Previous to the discussion of the Base-line comparisons, it is necessary to refer to experiments for determining the expansion of the standards.

Before forwarding the bars from England they were subjected to experiment, under the superintendence of the Astronomer Royal, G. B. Airy, Esq., in a cellar of their makers house, Messrs. Troughton and Simms,—the result of which is embodied in the following extract from a communication to me, from Mr. Airy, dated August 13, 1840:—

" By examination of Cape Bar A, the expansion of 10 feet of iron for 1° Fahrenheit appears to be

					inch.
From	45°	to	59°	Fahrenheit	0·000714
„	59	„	74	„	0·000734
„	74	„	79	„	0·000757
„	97	„	119	„	0·000798
„	119	„	139	„	0·000864.

By examination of Cape Bar B, the expansion of 10-feet of iron for 1° of Fahrenheit appears to be

From	44	to	65	Fahrenheit	0·000745
„	65	„	80	„	0·000732
„	80	„	105	„	0·000741
„	105	„	121	„	0·000817.

It is important to observe that the expansion for 1° increases as the temperature rises.

"In the reduction of the comparisons in which all the temperatures are near 45°, to be reduced to 62°, I have used 0·000730 (the mean of the two results for that part of the scale). This is considerably less than you will usually find in tables of expansion; but I have no doubt that the tables are wrong, for the following reason. The expansions have always been determined by comparing the lengths at 32° and 212°: but if (as appears above) the expansion increases rapidly with the rising temperatures, it is plain that the number so obtained is much too large for temperatures near 59° or 60°.

§ 8. Experiments in London: on the expansion of iron bars A and B.

Taking therefore 0·000730 in. for the iron, and 0·001257 in. for the brass (which is the number adopted by Mr. Baily, though for the reason above it may be erroneous, as it was determined by 32° and 212°). I obtain as follows, (all being reduced to 62° Fahrenheit):—

Relative lengths of Cape Standards A and B, Ordnance, and Royal Astronomical Society's.

				inch.
Cape Bar A	=	double Astronomical Society's Scale		– 0·00312
Cape Bar B	=	do.	do.	– 0·00361
Simm's Standard	=	do.	do.	– 0·00265
Col. Colby's Bar No. 1	=	do.	do.	– 0·00179
Col. Colby's Bar No. 2	–	do.	do.	0·00150."

The rate of expansion given for the lower recorded (*a*) temperature of bar B presents a singular anomaly, of which there is no trace in the expansion of bar A. Assuming homogenity in the elementary molecules of the bar, it may have been produced by some accidental influence, which might not recur.

The following table gives the mean expansion in relation to the arguments of temperature for both bars, deduced from a mean curve, which equally distributes the minute differences:—

Mean expansion deduced from a curve drawn through Mr. Airy's numbers.

BASE-LINE.—TABLE VIII.

Temp. of Bar.	Expansion.	Temp. of Bar.	Expansion.	Temp. of Bar.	Expansion.	Temp. of Bar.	Expansion.
°	in.	°	in.	°	in.	°	in.
45	0·000730	59	0·000732	73	0·000737	87	0·000748
46	730	60	732	74	737	88	749
47	730	61	732	75	738	89	750
48	730	62	732	76	739	90	752
49	730	63	733	77	739	91	753
50	730	64	733	78	740	92	754
51	730	65	733	79	741	93	756
52	731	66	734	80	741	94	757
53	731	67	734	81	742	95	759
54	731	68	734	82	743	96	761
55	731	69	735	83	744	97	763
56	731	70	735	84	745	98	765
57	731	71	736	85	746	99	767
58	0·000731	72	0·000736	86	0·000747	100	0·000769

(*a*) Table XV contains the experiments forwarded by the Astronomer Royal.

§ 8. The following table gives the expansions employed in the reduction of the micrometer measures of the iron standard B, to 62° Fahrenheit, taken during the measurement of the Base-line. It is deduced from the preceding table (Base-line table VIII), by taking the mean of all the expansions corresponding to the given temperature, and 62° inclusive.

In the reduction of the comparisons of the standards A and B, made in the telescope room of the *Royal Observatory, inter se*, the rate of expansion was taken at 0·0007312 in. for 1° of Fahrenheit: the equivalent in terms of the micrometer is 0·14624 rev.

In the reduction of the comparisons of the compensation bars with the standard bars in the telescope room of the *Royal Observatory;* the rate of expansion of the standards was taken at 0·0007316 in., equivalent to 0·14632 rev. of the micrometer, for 1° Fahrenheit:—

Table for reducing to 62° the comparisons made with standard B, on the Base-line.

BASE-LINE.—TABLE IX.

Temp. of Bar.	EXPANSION.		Temp. of Bar.	EXPANSION.		Temp. of Bar.	EXPANSION.	
	Inch.	Revolutions: 1 r. = ·005 in.		Inch.	Revolutions: 1 r. = ·005 in.		Inch.	Revolutions: 1 r. = ·005 in.
°			°			°		
53	0·0007314	0·14628	66	0·0007330	0·14660	79	0·0007359	0·14718
54	·0007314	·14628	67	·0007333	·14666	80	·0007362	·14724
55	·0007315	·14630	68	·0007333	·14666	81	·0007365	·14730
56	·0007316	·14633	69	·0007335	·14670	82	·0007368	·14736
57	·0007317	·14634	70	·0007336	·14672	83	·0007371	·14742
58	·0007318	·14636	71	·0007340	·14680	84	·0007374	·14748
59	·0007320	·14640	72	·0007341	·14682	85	·0007378	·14756
60	·0007320	·14640	73	·0007343	·14686	86	·0007382	·14764
61	·0007320	·14640	74	·0007345	·14690	87	·0007385	·14770
62	·0007320	·14640	75	·0007348	·14696	88	·0007390	·14780
63	·0007325	·14650	76	·0007351	·14702	89	·0007393	·14786
64	·0007327	·14654	77	·0007353	·14706	90	0·0007398	0·14796
65	0·0007328	0·14656	78	0·0007356	0·14712			

4. *Reduction of the readings of the Standard Bars B and A to 62° Fahrenheit, for comparison with the Compensation Bars.*

Comparisons made on the Base-line.

The comparisons of the several bars at the Base-line (and subsequently at the Observatory) were made by myself, Mr. Smyth, and Mr. Mann, excepting a few in the early part of the operation (in the barn at Koekoek Valei), where Captain Henderson took a share. Three partial measures by each microscope were registered for a comparison of each bar. The standard was first brought under the microscopes, next the compensation bars in succession, then the standards; and the mean between the two readings of the standard was taken for the comparison with the compensation bars. When several sets of comparisons were taken in succession, the rule to calliper the readings of the compensation bars, by the readings for the standard, was not altered.

Base-line table X, presents an abstract of the reduction to 62° Fahrenheit of the readings of the standard B, when compared with the compensation bars (a). The calculations in greater detail would consume too much space.

§ 8. Reduction of standard bar B to 62°.

The first and second columns give the date, and the significant number of each comparison :

The third gives the sums of the microscope readings, corrected to 20 revolutions of the screw for 0·1 inch: (b)

The fourth gives the mean of the readings of the two attached thermometers ($t°$), whose bulbs are immersed in olive oil within holes in the bars; and the fifth gives their differences from 62° :

The sixth gives the expansion, in terms of the micrometer corresponding to $62—t°$, extracted from the last table (Base-line IX):

And the seventh (the sum or difference of the third and sixth) gives the sums of the microscopes reduced to 62°, which are immediately comparable with the readings of the compensation bars, for difference in length.

Base-line table XI is similar to X: it gives the reduction to 62° of the standard bar A, for the instants of comparison with the compensation bars; which comparisons were all made in the telescope room of the Observatory, after the measurement of the Base.

Reduction of Standard Bar A to 62°.

5. *Abstract of the Comparisons of the Compensation Bars, with the Standard B, reduced to 62° Fahrenheit.*

The trial comparisons in the Koekoek Valei barn, between the standard bar B and the compensation bars, which were made by means of the beam compass, before that instrument was properly trussed, have not been used in the calculations: nor two sets on December 21 and 22, made in shed No. 1, when microscope A was discovered to be loose: these comparisons, therefore, are not printed.

Base-line table XII, exhibits the differences, in terms of the micrometer, between the standard B reduced to temperature 62° and the several compensation bars; where one revolution of the micrometer equals ·005 inch. The numbers do not present the degree of uniformity, which might have been expected to result from the care that was taken in every detail of the experiments. One of the prominent features is the greater accordance among those made in the more uniform temperature in the telescope room of the Observatory, where also the several appliances were more perfect than could be secured in the open plain. Another is the unexpected fact, that several of those

(a) Standard B was employed on the Base-line: A was left at the Observatory.

(b) The screw heads were turned towards the centre of the bar, ∴ a greater reading implies a greater length.

§ 3. made in the barn at Koekoek Valei, where the microscopes were attached to stone pillars, and the temperature more uniform than in the sheds, present such grave anomalies as to render it doubtful if they should be taken into account in the reductions.

In general, the comparisons made on the Base-line, by means of the microscopic beam compass, are not so accordant as those with the microscopes attached to stone pillars; yet it will be seen hereafter, that their means differ from each other by only ·000012 inch on $52\frac{1}{2}$ feet.

Table XII, shewing the differences given by the comparisons of the standard B with the compensation bars.

The first column of the table gives the dates.

The next columns, headed by the distinguishing letters of the compensation bars, exhibit the differences of each from the standard.

The eighth column gives the sum of the differences, and the ninth and tenth give the mean temperature of the standard bar and of the air during the time of experiment.

Table XIII, shewing the differences given by the comparisons of the standard A with the compensation bars.

(Base-line table XIII, gives a similar abstract of the comparisons of the compensation bars, with standard bar A reduced to 62° Fahrenheit, which were made at the Observatory, after the measurement of the Base. No use has been made of this table in calculating the length of the Base.)

(Continued at page 359).

ABSTRACT OF THE RESULTS OF THE COMPARISONS OF THE COMPENSATION BARS, WITH THE STANDARD B, REDUCED TO 62° FAHRENHEIT.

	No. of Sets.	Excess of each bar above the standard bar.					Sums.	Equivalent in inch.	DATES.	REMARKS.
		A	B	C	E	G				
	div.	div.	div.	div.	div.	div.	div.	inch.		
BASE-LINE:									1840—1841.	The comparisons made in the Koekoek Valei barn, before October 30, are omitted from these calculations, because of their discrepancies.
Koekoek Valei Barn.	7	27 95	117·63	114·14	111·84	14·54	386·10	0·019305	November 13—30	With Ordnance Microscopes attached to piers.
" " "	3	25·40	107·24	105·03	103·40	8·03	349·10	0·017455	December 16	With Ordnance Microscopes attached to piers.
Shed No. 1...............	13	27·62	116·89	114·26	105·87	21·55	386·19	0·019310	Dec. 22—Jan. 13	With Microscopes A and B attached to beam.
" " 2...............	37	24·45	115·83	115·40	109·92	18·70	384·30	0·019215	Jan. 20—Feb. 8	With Microscopes A and B attached to beam.
" " 3...............	17	19·47	108·28	101·97	103·13	2·89	335·74	0·016787	Feb. 11—Feb. 18	With Microscopes A and B attached to beam.
" " 4...............	27	32·31	112·48	112·86	101·64	15·28	374·57	0·018729	Feb. 22—March 12	With Microscopes A and B attached to piers.
" " 5...............	17	31·60	114·65	108·40	100·36	13·04	368·05	0·018403	March 17—April 23	With Microscopes A and B attached to piers.
From comparisons made with Microscopes attached to piers	54	31·14	113·54	111·19	102·66	14·07	372·60	0·018630		Owing to the accident on November 6, 1840, when 40 series of 6 bars had been measured, bar D was omitted from that date.
From comparisons made with Microscopic beam-compass	67	23·80	114·12	111·77	107·42	15·24	372·35	0·018618		Series 40—55 = 15, were measured with bars A, B, C, and G; and during the remainder of the operation with A, B, C, G, and E, except the last (No. 811), which was measured with A, B, and C.
Mean	121	27·07	113·86	111·51	105·29	14·71	372·45	0·018623		
ROYAL OBSERVATORY:									1841.	
Comparisons made in the telescope-room..	51	41·25	128·28	127·38	115·88	27·16	439·95	0·021998	Aug. 19—Sept. 2	
Mean of the comparisons with Standard B.	172	31·28	118·13	116·22	108·43	18·40	392·46	0·019623		
Mean of the comparisons made with Standard A..........	37	41·33	126·69	124·85	114·18	27·26	434·41	0·021721	Sept. 2—Sept. 7	

1 division of the Micrometer = 0·00005 inch.

As before stated, the first 12 sets of comparisons made in the Koekoek Valei barn are very discordant, and have been omitted from the preceding calculations; but it is necessary to employ them for the purpose of obtaining the relation of bars D and E to the other bars, before the accident on November 6, 1840.

The mean excess of each bar over the standard B, deduced from the comparisons on the Base-line and subsequently at the Observatory, is as follows:—

	A	B	C	D	E	G		Sum
	div.	div.	div.		div.	div.		div.
(1)	31·28,	118·13,	116·22,	,	108·43,	18·40,	=	392·46.

The first 12 sets in the barn give

	A	B	C	D	E		G
(2)	15·71,	102·77,	86·20,	1·41,	55·82	—	6·81.

The differences of A, B, C, G, are 15·57, 15·36, 30·02, 25·21; the mean being 21·54. Adding 21·54 to D and E in (2), the excesses of the six bars before the accident become

$$31 \cdot 28,\ \ 118 \cdot 13,\ \ 116 \cdot 22,\ \ 22 \cdot 95,\ \ 77 \cdot 36,\ \ 18 \cdot 40, = \overset{\text{Sum.}}{384 \cdot 34} = 0 \cdot 019217 \text{ inch.}$$

Hence we have the mean excess of

A, B, C, D, E, G,	above Standard B			= 0·019217
A, B, C, G,	„	„		= 0·014202
A, B, C, E, G,	„	„		= 0·019623
A, B, C,	„	„		= 0·013281

6. *Calculation of the Zwartland Base, and reduction to the Ordnance Standard* $\mathbf{O}_1$.

It has been shown (page 253) that the apparent length of the Zwartland Base is 42818·75 feet; or expressed differently as follows:—

(1).	40	Series of	6	Bars	(A, B, C, D, E, G)	=	240 bars.
(2).	15	„	4	„	(A, B, C, G)	=	60 „
(3).	755	„	5	„	(A, B, C, E, G)	=	3775 „
(4).	1	„	3	„	(A, B, C)	=	3 „
					Whole number of Bars	=	4078 = 40780·00 feet.

Whole number of Bars = whole number of Microscopes	4078	
Deduct for ½ Microscope M, in series 88	0·5	
	4077·5	= 2038·75
		42818·75

Reductions.

I. To convert the Compensation Bars into terms of Standard B.

Series.		inch.		inch.
40	×	0·019217	=	0·76868
15	×	0·014202	=	0·21303
755	×	0·019623	=	14·81537
1	×	0·013281	=	0·01328

Sum = 15·81036 = 1·31753 feet.

to be *added* to the approximate length of the Base.

II. To convert Standard B into terms of the Ordnance Standard $\mathbf{O}_I$ (see "Measurement of Loch Foyle Base," pages 100, 101). § 8. Reduction to Ordnance Standard $\mathbf{O}_I$.

$$\text{Cape Bar B} = \mathbf{O}_I - 0\cdot0001502 \text{ foot}$$
$$\therefore\ 4078 \text{ Bars} \times 0\cdot0001502 = 0\cdot61252 \text{ foot,}$$

to be *deducted* from the approximate length of the Base-line.

III. To convert the 6-inch Brass Standard into terms of the mean foot of $\mathbf{O}_I$.

Calling O $^{6\text{-inch}}$, the Ordnance six-inch Standard.

C $^{6\text{-inch}}$, the Cape six-inch Standard.

And A $^{0\text{ in.}-6\text{ in.}}$, the first six inches of the Royal Astronomical Society's scale: we have from the above work,—

$$O^{6\text{-inch}} = A^{0-6\text{-inch}} + 0\cdot0000069 \text{ foot;}$$
$$\text{Also } C^{6\text{-inch}} = A^{0-6\text{-inch}}.$$
$$\therefore\ C^{6\text{-inch}} = O^{6\text{-inch}} - 0\cdot0000069 \text{ foot.}$$
$$\text{But } O^{6\text{-inch}} = \frac{\mathbf{O}_I}{20} - 0\cdot00002225$$
$$\therefore\ C^{6\text{-inch}} = \frac{\mathbf{O}_I}{20} - \left(0\cdot00002225 + 0\cdot0000069\right)$$
$$= \frac{\mathbf{O}_I}{20} - 0\cdot00002915 \text{ foot:}$$

and putting $\mathbf{O}_I = 10$ feet.

$C^{6\text{-inch}} = 0\cdot5 - 0\cdot00002915$ foot.

Consequently 0·00002915 × 4077·5 microscopes = 0·118858 foot; to be *deducted* from the approximate length of the Base-line.

Length of Zwartland Base, in terms of Ordnance Bar $\mathbf{O}_1$.

Length of Zwartland Base, in terms of Ordnance Bar $\mathbf{O}_1$.

Apparent Length in terms of Compensation Bars	42818·75000
I. Excess of Compensation Bars above Cape Standard B	+ 1·31753
II. Defect of Bar B below Ordnance $\mathbf{O}_1$	− 0·61252
III. Defect of Cape six-inch Standard, below mean half foot of $\mathbf{O}_1$	− 0·11886
Page 335 Expansion of Cape six-inch Standard, above 62°	+ 0·11724
Page 317 Reduction to Level of the Sea	− 0·38750
Page 315 Correction for Errors of Alignment	− 0·00056
	42819·06533

The length of the Zwartland Base-line, in terms of the Ordnance Standard $\mathbf{O}_1$, at the temperature 62° Fahrenheit, and at the level of the Sea = 42819·065 feet. Log. 4·6316371·4.

(*Continued from page* 354).

6. *Abstract of the direct comparisons made in the telescope-room of the Observatory, between the two 10-feet Cape Standard Bars A and B, and calculation of their difference in length.* § 8.

The bars were compared for length in London through the intervention of the Royal Astronomical Society's 5-feet scale (page 351). The experiments for this purpose and for the thermal expansion, are given in extenso after table XIV, at the end of this section, as received from the Astronomer Royal. Experiments in London.

On the arrival of the bars at the Cape, and before B was removed to Zwartland, 24 comparisons were made in the telescope-room of the Observatory,—the supports resting upon the boarded floor. After the measurement of the Base, and an interval of twelve months from the first, 240 comparisons were made in the same room,—the supports resting upon the isolated pier; bar A during the interval having remained undisturbed in the room, while B was on active service in the field. Comparisons for the difference in length of A and B at the Cape.

A third determination, or second indirect result, is available through the experiments for the relative lengths of both bars and the compensation bars, which were made in the same room, and under similar circumstances with the direct experiments.

And here it is necessary to revert to the statement in the fourth article (page 352), that three partial measures by each microscope were registered for a comparison of each bar; in other words,—each dot was bisected three times at each comparison. It should also have been stated, that this rule referred to the experiments at the Base-line, and to only a few in the telescope-room; but for the chief part of those made in this room, five bisections were made. No. of bisections for a mean reading.

A strict record has not been kept of the positions of individual observers with respect to individual microscopes, except for the direct comparisons of the standards. In this instance, on the bar dots being brought into focus, Mr. Mann first stationed himself at microscope A, and registered the readings of five bisections, while Mr. Maclear or Mr. Smyth at microscope B did the same; the parties then changed places and repeated the bisections. The bar being replaced by the other, the same course with respect to order was pursued. The personal equations deduced from the experiments were not so accordant as might have been expected;—a matter of no importance, since they are eliminated by the method of combining the observations. Personal Equation.

Table XIV exhibits the direct comparisons and the results, from which it appears by 264 comparisons, that A—B = 0·0001189 in.

$$A - B = 0\cdot0001189 \text{ inch.}$$

By the indirect process of the compensation bars:

Compensation Bars — A	= 0·021721 inch.	37 comparisons.	
Compensation Bars — B	= 0·021998 inch.	51	,,
Hence A—B	= 0·000277		

By the experiments in London:

Bar A = double Astronomical Society's scale — 0·00312
Bar B = double Astronomical Society's scale — 0·00361
Hence A—B = 0·00049 inch.

The result from the compensation bars is comparatively of little value perhaps; but why the London should differ from the Cape determination, by so much as 0 000371 inch, is difficult to conjecture.

END OF THE DESCRIPTION OF THE MEASUREMENT OF THE BASE.

Reduction of the readings of the Standard bar B to 62° Fahrt., for the comparisons with the Compensation Bars, made at the Base-line.

Date.	No.	Sums of Microscopes.	Mean of Thermometers.	62°—t.	Expansion in Revolutions.	Sums reduced to 62°.	Date.	No.	Sums of Microscopes.	Mean of Thermometers.	62°—t.	Expansion in Revolutions.	Sums reduced to 62°.
1840.		rev.	°	°	rev.	rev.	1841.		rev.	°	°	rev.	rev.
Oct. 12	1	2·1511	63·62	− 1·62	−0·2374	1·9137	Jan. 6	263	6·2639	64·20	− 2·20	−0·3224	5·9415
	8	2·4508	65·85	3·85	0·5644	1·8864		269	6·2718	65·10	3·10	0·4543	5·8175
13	10	1·6955	66·33	4·33	0·6348	1·0607		270	6·3264	65·30	3·30	0·4837	5·8427
	16	2·1102	68·83	6·83	1·0020	1·1082		276	6·2438	66·25	4·25	0·6231	5·6207
	23	2·1725	70·72	8·72	1·2801	0·8924	9	277	8·3267	75·90	13·90	2·0436	6·2831
	30	2·1111	71·65	9·65	1·4168	0·6943		283	8·3418	75·35	13·35	1·9621	6·3797
14	31	1·4288	63·10	1·10	0·1612	1·2676		284	8·3056	75·15	13·15	1·9325	6·3731
	38	1·7899	64·67	2·67	0·3913	1·3986	10	285	6·0906	65·25	3·25	0·4763	5·6143
	39	1·9165	65·08	3·08	0·4514	1·4651		295	6·3196	67·35	5·35	0·7846	5·5350
	46	1·9758	66·88	4·88	0·7157	1·2601		296	6·3040	67·65	5·65	0·8286	5·4754
	47	2·5297	70·70	8·70	1·2770	1·2600		302	6·3478	68·60	6·60	0·9681	5·3797
	54	2·6951	71·18	9·18	1·3476	1·3475		303	6·0590	75·25	13·25	1·9474	4·1116
15	56	1·4396	63·10	1·10	0·1612	1·2784		314	6·0442	74·10	−12·10	−1·7775	4·2667
	63	1·8834	64·38	2·38	0·3488	1·5346	11	315	5·6578	58·45	+ 3·55	+0·5196	6·1774
	71	2·0849	65·77	3·77	0·5527	1·5322		321	5·2968	58·05	+ 3·95	+0·5781	5·8749
	72	2·1384	66·22	4·22	0·6187	1·5197		322	5·3821	58·00	+ 4·00	+0·5854	5·9675
	79	2·0810	67·72	5·72	0·8389	1·2421		323	4·8598	81·80	−19·80	−2·9173	1·9425
	86	2·3467	69·10	7·10	1·0416	1·3051		325	4·9839	81·80	19·80	2·9173	2·0666
29	87	3·9682	66·25	4·25	0·6231	3·3451		327	4·9922	81·80	19·80	2·9173	2·0749
	93	4·3955	68·87	6·87	1·0078	3·3877		328	4·9675	81·80	19·80	2·9173	2·0502
30	94	4·0257	65·38	3·38	0·4954	3·5303		330	4·9446	81·80	19·80	2·9173	2·0273
	101	3·8281	65·00	3·00	0·4397	3·3884		332	5·0836	81·85	19·85	2·9247	2·1589
Nov. 13	102	4·3848	65·93	3·93	0·5761	3·8087		334	4·9593	81·85	19·85	2·9247	2·0346
	108	4·7070	68·05	6·05	0·8873	3·8197	13	341	5·2011	83·50	21·50	3·1704	2·0307
18	109	2·8976	65·15	3·15	0·4617	2·4359		347	5·2166	84·95	22·95	3·3864	1·8302
	115	3·1555	67·33	5·33	0·7817	2·3738		348	6·3433	89·30	27·30	4·0376	2·3057
19	116	4·9328	78·15	16·15	2·3760	2·5568		354	6·3005	89·50	27·50	4·0678	2·2327
	122	5·1732	79·50	−17·50	2·5763	2·5969		360	6·4810	89·60	27·60	4·0826	2·3984
30	123	2·5667	61·65	+ 0·35	+0·0512	2·6179	20	361	7·9628	73·30	11·30	1·6597	6·3031
	129	2·5783	62·25	− 0·25	−0·0366	2·5417		367	7·8408	73·20	11·20	1·6449	6·1959
	135	2·8334	63·23	1·23	0·1802	2·6532		373	7·8557	73·10	11·10	1·6304	6·2253
	136	2·9988	64·77	2·77	0·4060	2·5928	22	374	3·9172	84·85	22·85	3·3717	0·5435
	142	3·1633	66·02	4·02	0·5893	2·5740		380	3·8453	84·70	22·70	3·3492	0·4961
	148	3·2013	67·08	5·08	0·7450	2·4563		386	3·7656	84·40	22·40	3·3044	0·4612
Dec. 11	149	5·1189	78·50	16·50	2·4281	2·6908	23	387	15·3255	67·75	5·75	0·8433	14·4822
	160	4·7853	77·85	15·85	2·3319	2·4534		393	15·2622	67·55	5·55	0·8140	14·4482
13	161	3·4221	71·93	9·93	1·4579	1·9642		399	15·2904	67·50	5·50	0·8066	14·4838
	167	3·3561	72·50	10·50	1·5418	1·8143	24	400	16·0801	74·40	12·40	1·8217	14·2584
	173	3·6449	72·60	10·60	1·5565	2·0884		406	15·9523	74·35	12·35	1·8145	14·1378
	179	3·6835	72·60	10·60	1·5565	2·1270		412	16·1246	74·30	12·30	1·8071	14·3175
15	180	8·6732	77·25	15·25	2·2427	6·4305	25	413	14·2855	64·55	2·55	0·3737	13·9118
	186	9·1288	77·45	15·45	2·2724	6·8564		424	14·2956	64·35	− 2·35	−0·3444	13·9512
	192	8·6972	77·55	15·55	2·2875	6·4097	26	425	13·4943	59·70	+ 2·30	+0·3367	13·8310
	198	8·5183	77·55	15·55	2·2875	6·2308		431	13·5179	59·70	2·30	0·3367	13·8546
	199	8·8086	77·40	15·40	2·2650	6·5436		437	13·3170	59·80	+ 2·20	+0·3221	13·6391
	205	8·6689	77·10	−15·10	−2·2206	6·4483	27	438	14·0132	64·25	− 2·25	−0·3297	13·6835
16	211	2·1326	60·15	+ 1·85	+0·2708	2·4034		444	14·0452	64·25	2·25	0·3297	13·7155
	217	2·1540	62·83	− 0·83	−0·1216	2·0324		450	13·9701	64·50	2·50	0·3664	13·6037
	223	2·4898	65·37	3·37	0·4939	1·9959	28	451	12·8962	62·10	− 0·10	−0·0146	12·8816
	229	2·9044	68·45	6·45	0·9461	1·9583		457	12·8895	61·95	+ 0·05	+0·0073	12·8968
21	230	12·9990	84·70	22·70	3·3492	9·6498		463	12·8412	61·95	+ 0·05	+0·0073	12·8485
	236	13·2914	84·65	22·65	3·3418	9·9496		464	14·7944	78·75	−16·75	−2·4649	12·3295
	242	13·3586	84·55	22·55	3·3271	10·0315		470	15·0022	78·85	16·85	2·4796	12·5226
22	243	2·9709	62·30	0·30	0·0439	2·9270		476	15·0145	78·95	16·95	2·4947	12·5198
	249	2·7458	62·00	− 0·00	−0·0000	0·0000	29	482	14·6494	81·75	19·75	2·9100	11·7394
	255	2·7614	61·75	+ 0·25	+0·0366	2·7980		488	14·9464	82·10	20·10	2·9623	11·9841
	256	3·0916	61·85	0·15	0·0220	3·1136		489	15·1495	82·80	20·80	3·0659	12·0836
	262	2·9397	61·75	+ 0·25	+0·0366	2·9763		495	15·1694	82·75	−20·75	−3·0590	12·1104

Expansion for 1° = 0·0007316 inch = 0·14632 revolutions. 1 revolution of the Micrometer = ·005 inch.

Reduction of the readings of the Standard bar B to 62° Fahrenheit—continued.

Date.	No.	Sums of Microscopes.	Mean of Thermometers.	62°—t.	Expansion in Revolutions.	Sums reduced to 62°.	Date.	No.	Sums of Microscopes.	Mean of Thermometers.	62°—t.	Expansion in Revolutions.	Sums reduced to 62°.
1841.		rev.	°	°	rev.	rev.	1841.		rev.	°	°	rev.	rev.
Jan. 29	496	15·2529	82·75	−20·75	−3·0590	12·1939	Feb. 18	733	10·0154	67·60	− 5·60	−0·8213	9·1941
	502	15·2220	82·70	20·70	3·0512	12·1708		734	9·9671				
31	503	14·8011	81·30	19·30	2·8433	11·9578		735	9·9557	67·30	5·30	0·7773	9·1784
	509	14·8352	81·40	19·40	2·8580	11·9772	22	736	7·3972	70·40	8·40	1·2328	6·1644
	515	14·8236	81·45	19·45	2·8654	11·9582		742	7·7355	72·45	10·45	1·5345	6·2010
Feb. 3	516	15·8973	79·85	17·85	2·6282	13·2691		749	8·1275	75·05	13·05	1·9178	6·2097
	522	15·8867	79·75	17·75	2·6135	13·2732	23	750	5·5268	78·50	16·50	2·4281	3·0987
	528	15·8349	79·55	17·55	2·5841	13·2508		756	5·4213	78·25	16·25	2·3910	3·0303
4	529	14·8794	79·00	17·00	2·5021	12·3773		762	5·3589	77·75	15·75	2·3168	3·0421
	535	14·8729	79·30	17·30	2·5462	12·3267	24	763	6·0675	82·45	20·45	3·0135	3·0540
	545	14·9200	79·75	17·75	2·6135	12·3065		769	6·0058	82·25	20·25	2·9840	3·0218
	556	14·9080	79·95	17·95	2·6430	12·2650	25	770	4·0715	70·80	8·80	1·2917	2·7798
7	557	14·0037	75·60	13·60	1·9995	12·0042		776	3·8709	69·50	7·50	1·1004	2·7705
	563	14·0022	75·55	13·60	1·9919	12·0103		777	4·7848	74·55	12·55	1·8441	2·9407
	569	13·9877	75·50	13·50	1·9848	12·0029		783	4·8453	75·15	13·15	1·9325	2·9123
	570	14·0161	75·45	13·45	1·9768	12·0393		789	4·8841	75·60	13·60	1·9992	2·8849
	576	14·1189	75·40	13·40	1·9695	12·1494	26	790	3·0838	64·50	2·50	0·3664	2·7174
	582	14·0274	75·40	−13·40	−1·9695	12·0579		796	2·9291	64·00	2·00	0·2931	2·6360
8	583	13·8874	57·35	+ 4·65	+0·6805	14·5679		797	5·6845	81·30	19·30	2·8433	2·8412
	589	13·8302	57·15	4·85	0 7097	14·5399		803	5·7216	81·05	19·05	2·8061	2·9155
	590	13·7394	58·80	3·20	0·4685	14·2079		809	5·6371	80·80	−18·80	−2·7659	2·8682
	596	13·7978	59·20	2·80	0·4099	14·2077	27	810	3·5998	61·70	+ 0·30	+0·0439	3·6437
	602	13·8863	59·55	+ 2·45	+0·3587	14·2450		816	2·6049	61·35	0·65	0·0952	2·7001
11	604	12·8104	77·45	−15·45	−2·2724	10·5380		822	2·5784	61·20	+ 0·80	+0·1171	2·6955
	606	12·7634	77·50	15·50	2·2797	10·4837		823	4·4215	73·15	−11·15	−1·6375	2·7840
	608	12·8645	77·50	15·50	2·2797	10·5848		829	4·4463	73·75	11·75	1·7258	2·7205
	610	12·8726	77·50	15·50	2·2797	10·5929		835	4·5421	74·15	12·15	1·7848	2·7573
	612	12·8756	77·50	15·50	2·2797	10·5959	28	836	5·5016	80·75	18·75	2·7615	2·7401
12	613	11·8555	67·05	5·05	0·7406	11·1149		837	5·5050	80·75	18·75	2·7615	2·7435
	619	11·7867	66·80	4·80	0·7040	11·0827		843	5·6500	81·55	19·55	2·8805	2·7695
	625	11·7292	66·50	4·50	0·6599	11·0693		849	5·7629	82·05	20·05	2·9546	2·8083
13	626	11·1854	67·10	5·10	0·7480	10·4374	Mar. 1	850	4·1951	73·55	11·55	1·6965	2·4986
	632	11·1323	66·75	4·75	0·6966	10·4357		856	4·1117	73·10	11·10	1·6302	2·4815
	638	10·9943	66·40	4·40	0·6452	10·3491		862	4·0904	72·85	10·85	1·5934	2·4970
	639	13·3963	85·80	23·80	3·5134	9·8829	2	863	6·5895	88·90	26·90	3·9774	2·6121
	645	13·4684	85·85	23·85	3·5207	9·9477		869	6·6519	89·30	27·30	4·0371	2·6148
	651	13·4515	85·85	23·85	3·5207	9·9308		875	6·7310	89·85	27·85	4·1201	2·6109
14	652	11·9130	78·50	16·50	2·4281	9·4849	4	876	3·4628	71·40	9·40	1·3800	2·0828
	654	11·9204	78·55	16·55	2·4355	9·4849		881	3·3340	71·40	9·40	1·3800	1·9540
	656	11·9449	78·70	16·70	2·4576	9·4873	5	882	3·1771	63·80	1·80	0·2638	2·9133
	658	11·9740	78·85	16·85	2·4800	9·4940		888	2·9315	63·35	1·35	0·1978	2·7337
	660	11·9857	78·95	16·95	2·4947	9 4910		889	5·1128	73·75	11·75	1·7261	3·3867
	662	11·9768	79·00	17·00	2·5021	9·4747		895	5·0283	73·45	−11·45	−1·6818	3·3465
	663	12·0554	79·15	17·15	2·5241	9·5313	6	898	1·8108	60·70	+ 1·30	+0·1903	2·0011
	669	12·1048	79·65	17·65	2·5984	9·5064		904	1·7021	60·60	1·40	0 2050	1·9071
	675	12·0903	79·90	17·90	2·6356	9·4547		910	1·7158	60 80	+ 1·20	+0·1757	1·8915
16	676	12·6778	86·15	24·15	3·5655	9·1123	11	911	8·3436	65·55	− 3·55	−0·5204	7·8232
	682	12·8114	85·95	23·95	3·5360	9·2754		917	8·3360	65·70	− 3·70	−0·5423	7·7937
	688	12·6870	85·60	23·60	3·4834	9·2036	12	918	6·3189	56·25	+ 5·75	+0·8413	7·1602
17	689	10·2754	69·70	7·70	1·1297	9·1457		924	6·3879	55·90	+ 6·10	+0·8926	7·2805
	695	10·3680	70·20	8·20	1·2031	9·1649	17	925	7·1173	69·85	− 7·85	−1·1517	5·9656
	701	10·3941	70·40	8·40	1·2326	9·1615		931	6·9416	68·75	6·75	0·9901	5·9515
	707	10·3862	71·85	9·85	1·4462	8·9400		932	7·4109	73·15	11·15	1·6375	5·7734
	713	10·5048	72·30	10·30	1·5125	8·9923		938	7·5951	74·25	12·25	1·7997	5·7954
	714	11·6106	79·85	17·85	2·6282	8·9824		944	7·7344	75·05	13·05	1·9178	5·8166
	720	11·6099	79·85	17·85	2·6282	8·9817	18	945	9·3550	87·05	25·05	3·6999	5·6551
18	721	10·1844	68·05	6·05	0·8873	9·2971		951	9·5427	89·05	27·05	3·9996	5·5431
	727	10·0861	67·70	− 5·70	−0·8360	9·2501	19	953	5·8639	63·40	− 1·40	−0·2051	5·6588

Expansion for 1° = 0·0007316 inch = 0·14632 revolutions. 1 revolution of the Micrometer = ·005 inch.

Reduction of the readings of the Standard bar B to 62° *Fahrenheit*—continued.

Date.	No.	Sums of Microscopes.	Mean of Thermometers.	62°—*t*.	Expansion in Revolutions.	Sums reduced to 62°.
1841.		rev.	°	°	rev.	rev.
Mar. 19	959	5·7659	63·35	− 1·35	−0·1978	5·5681
	960	8·6671	83·50	21·50	3·1704	3·4967
	966	9·0272	86·10	24·10	3·5581	5·4691
21	967	6·3948	69·35	7·35	1·0782	5·3166
	973	6·4898	69·90	7·90	1·1590	5·3308
	974	8·4499	74·80	12·80	1·8808	6·5691
	980	8·6746	76·00	14·00	2·0583	6·6163
	981	9·2176	79·65	17·65	2·5984	6·6192
	987	9·2260	79·55	17·55	2·5837	6·6423
	988	8·7845	76·25	14·25	2·0951	6·6894
	994	8·6887	75·70	13·70	2·0139	6·6748
	995	8·6788	75·70	13·70	2·0139	6·6649
23	996	7·7554	67·45	5·45	0·7993	6·9561
	1002	8·0068	68·85	6·85	1·0049	7·0019
24	1003	8·6489	73·15	11·15	1·6375	7·0114
	1009	8·6724	73·10	−11·10	−1·6302	7·0422
28	1010	6·8259	61·75	+ 0·25	+0·0366	6·8625
	1016	6·8868	61·85	0·15	0·0220	6·9088
	1017	6·8611	61·95	+ 0·05	+0·0073	6·8684
	1018	8·5375	71·60	− 9·60	−1·4095	7·1280
	1024	8·5903	71·58	9·58	1·4065	7·1838
April 5	1025	8·1758	68·85	6·85	1·0048	7·1710
	1031	8·2020	68·85	6·85	1·0048	7·1972
22	1032	4·2286	70·48	8·48	1·2445	2·9841
	1038	4·3929	70·93	8·93	1·3109	3·0820
23	1039	3·3805	65·50	3·50	0·5130	2·8675
	1045	3·4604	65·71	− 3·71	−0·5438	2·9166

At the Royal Observatory: Expansion for 1° Fahrenheit = 0·14632 revolutions.

Date.	No.	Sums of Microscopes.	Mean of Thermometers.	62°—*t*.	Expansion in Revolutions.	Sums reduced to 62°.
Aug. 19	1046	6·1627	56·55	+ 5·45	+0·7974	6·9601
	1052	6·2115	56·60	5·40	0·7901	7·0016
20	1053	5·9603	56·70	5·30	0·7755	6·7358
	1059	6·0596	56·70	5·30	0·7755	6·8351
	1060	6·0157	56·75	5·25	0·7682	6·7839
	1066	6·0415	56·95	5·05	0·7389	6·7804
	1067	6·0691	57·00	5·00	0·7317	6·8008
	1073	6·0678	57·25	4·75	0·6951	6·7629
21	1074	6·1426	56·95	5·05	0·7389	6 8815
	1080	6·1800	56·95	5·05	0·7389	6·9189
	1081	6·1963	57·05	4·95	0·7244	6 9207
	1087	6·2011	57·15	4·85	0·7097	6·9108
	1088	6·2355	57·30	4·70	0·6878	6·9233
	1094	6·2417	57·45	4·55	0·6658	6·9075
23	1095	5·9128	56·30	5·70	0·8340	6·7468
	1101	6·0079	56·45	5·55	0·8121	6·8200
	1102	6·1593	57·55	4·45	0·6512	6·8105
	1108	6·1663	57·70	4·30	0·6293	6·7956
	1114	6·2110	57·85	4·15	0·6073	6 8183
25	1115	6·0734	54·80	7·20	1·0534	7·1268
	1121	6·0588	54·90	7·10	1·0387	7·0975
	1122	6·0768	54·90	7·10	1·0387	7·1155
	1128	6·0959	55·00	7·00	1·0241	7·1200
	1129	6·1017	54·95	7·05	1·0314	7·1331
	1135	6·1204	55·15	6·85	1·0022	7·1226
	1136	6·1375	55·30	+ 6·70	+0·9802	7·1177

Date.	No.	Sums of Microscopes.	Mean of Thermometers.	62°—*t*.	Expansion in Revolutions.	Sums reduced to 62°.
1841.		rev.	°	°	rev.	rev.
Aug. 25	1142	6·1273	55·53	+ 6·47	+0·9466	7·0739
	1143	6·3003	56·00	6·00	0·8779	7·1782
	1149	6·2844	56 05	5·95	0·8706	7·1550
	1150	6·2706	56·05	5·95	0·8706	7·1412
	1156	6·2509	56·10	5·90	0·8633	7·1412
	1157	6·2545	56·20	5·80	0·8487	7·1032
	1163	6·3255	56·30	5·70	0·8340	7·1595
	1164	6·3068	56·35	5·65	0·8267	7·1335
	1170	6·2513	56·50	5·50	0·8084	7·0561
26	1171	6·2482	54·60	7·40	1·0826	7·3308
	1177	6·2903	54·55	7·45	1·0899	7·3802
	1178	6·2887	54·60	7·40	1·0826	7·3713
	1184	6·2890	54·70	7·30	1·0680	7·3570
	1185	6·3268	54·70	7·30	1·0680	7·3948
	1191	6·2948	54·80	7·20	1·0534	7·3482
	1192	6·3185	54·90	7·10	1·0387	7·3572
	1198	6·2997	55·03	6·97	1·0198	7·3195
	1199	6·3293	54·95	7·05	1·0314	7·3607
	1205	6·3073	55·05	6·95	1·0168	7·3241
	1206	6·3164	55·15	6·85	1·0023	7·3187
	1212	6·3113	55·30	6 70	0·9803	7·2916
28	1213	6·2200	56·10	5·90	0·8633	7·0833
	1219	6·2394	56·15	5·85	0·8560	7·0954
	1220	6·2340	56·20	5·80	0·8487	7·0827
	1226	6 0588	56·25	} 5·75	0·8413	6·9001
	1226	6·0598	56·25			
	1227	6·1645	56·35	5·65	0·8267	6·9912
	1233	6·1853	56·40	5·60	0·8194	7·0047
	1234	6·2028	56·35	5·65	0·8267	7·0295
	1240	6·2276	56·45	5·55	0·8121	7·0397
	1241	6·2217	56·55	5·45	0·7974	7·0191
	1247	6·2417	56·70	5·30	0·7755	7·0172
	1248	6·2121	56·95	5·05	0·7389	6·9510
	1254	6·1427	56·95	5·05	0·7389	6·8816
	1255	6·1769	56·95	5·05	0·7389	6·9158
	1261	6·1721	57·05	4·95	0·7244	6·8965
30	1262	6·2953	54·65	7·35	1·0753	7·3706
	1268	6·2714	54·75	7·25	1·0607	7·3321
	1269	6·2814	54·70	7·30	1·0680	7·3494
	1275	6·2592	54·80	7·20	1·0534	7·3126
	1276	6·2759	54·85	7·15	1·0460	7·3219
	1282	6·3161	54·95	7·05	1·0314	7·3475
	1283	6·3119	55·00	7·00	1·0241	7·3360
	1289	6·3148	52·20	6·80	0·9950	7·3098
	1290	6·2234	55·60	6·40	0·9364	7·1598
	1296	6·2097	55·65	6·35	0·9291	7·1388
	1297	6·2150	55·65	6·35	0·9291	7·1441
	1303	6·2204	55·70	6·30	0·9218	7·1422
	1304	6·2537	55·70	6·30	0·9218	7·1755
	1310	6·2340	55·90	6·10	0·8926	7·1266
	1311	6·2418	56·00	6·00	0·8779	7·1197
	1317	6·2351	56·05	5·95	0·8706	7·1057
	1318	6·2359	56·05	5·95	0·8706	7·1065
	1324	6.2399	56·10	5·90	0·8633	7·1032
Sept. 1	1325	6·0768	55·95	6·05	0·8852	6·9620
	1331	6·1002	56·05	5·95	0·8706	6·9708
	1332	6·1094	56·00	6·00	0·8779	6·9873
	1338	6·1012	56·00	+ 6·00	+0·8779	6·9791

Expansion for 1° = 0·0007316 inch = 0·14632 revolutions. 1 revolution of the Micrometer = ·005 inch.

BASE-LINE.—TABLE X.

Reduction of the readings of the Standard bar B to 62° Fahrenheit—continued.

Date.	No.	Sums of Microscopes.	Mean of Thermometers.	62°—*t*.	Expansion in Revolutions.	Sums reduced to 62°.	Date.	No.	Sums of Microscopes.	Mean of Thermometers.	62°—*t*.	Expansion in Revolutions.	Sums reduced to 62°.
1841.		rev.	°	°	rev.	rev.	1841.		rev.	°	°	rev.	rev.
Sept. 1	1339	6·1291	56·05	+ 5·95	+0·8706	6·9997	Sept. 1	1374	6·2773	57·25	+ 4·75	+0·6951	6·9724
	1345	6·1765	56·15	5·85	0·8560	7·0325		1380	6·3210	57·35	4·65	0·6805	7·0015
	1346	6·1917	56·15	5·85	0·8560	7·0477		1381	6·3136	57·35	4·65	0·6805	6·9941
	1352	6·1915	56·35	5·65	0·8267	7·0182		1387	6·3444	57·50	4·50	0·6585	7·0029
	1353	6·2127	56·50	5·50	0·8048	7·0175		1388	6·3441	57·55	4·45	0·6512	6·9953
	1359	6·2374	56·70	5·30	0·7755	7·0129		1394	6·3097	57·60	4 40	0·6439	6·9536
	1360	6·2895	57·00	5·00	0·7317	7·0212	2	1395	6·1820	56·45	5·55	0·8121	6·9941
	1366	6·2892	57·05	4·95	0·7244	7·0136		1401	6·2153	56·55	5·45	0·7974	7·0127
	1367	6·3099	57·20	4·80	0·7024	7·0123		1402	6·2565	56·55	5·45	0·7974	7·0539
	1373	6·2918	57·30	+ 4·70	+0·6878	6·9796		1408	6·2623	56·65	+ 5·35	+0·7828	7·0451

BASE-LINE.—TABLE XI.

Reduction of the readings of the Standard bar A to 62° Fahrt., for the comparisons with the Compensation Bars, made at the Base-line.

Date.	No.	Sums of Microscopes.	Mean of Thermometers.	62°—*t*.	Expansion in Revolutions.	Sums reduced to 62°.	Date.	No.	Sums of Microscopes.	Mean of Thermometers.	62°—*t*.	Expansion in Revolutions.	Sums reduced to 62°.
Sept. 2	1409	6·2797	56·90	+ 5·10	+0·7462	7·0259	Sept. 4	1542	6·2011	57·50	+ 4·50	+0·6585	6·8596
	1415	6·3182	57·00	5·00	0·7317	7·0499		1548	6·1939	57·60	4·40	0·6439	6·8378
	1416	6·3240	57·05	4·95	0·7244	7·0484		1549	6·1943	57 85	4·15	0·6073	6·8016
	1422	6·3545	57·30	4·70	0·6878	7·0423		1555	6·1844	57·95	4·05	0·5927	6·7771
	1423	6·3489	57·25	4·75	0·6951	7·0440		1556	6·1816	57·95	4·05	0·5927	6·7743
	1429	6·3655	57·45	4·55	0·6658	7·0313		1562	6·1765	58·05	3 95	0·5781	6·7546
	1430	6·3643	57·45	4·55	0·6658	7·0301		1563	6·1650	58·05	3·95	0·5781	6·7431
	1436	6·4197	57·55	4·45	0·6512	7·0709		1569	6·1812	58·10	3·90	0 5708	6·7520
	1437	6·4733	58·20	3·80	0·5562	7·0295		1570	6·1786	58·10	3·90	0·5708	6·7494
	1443	6·4750	58·30	3·70	0·5415	7·0165		1576	6·1968	58·25	3·75	0·5489	6·7457
	1444	6·4585	58·35	3·65	0·5342	6·9927	7	1577	6·2398	56·55	5·45	0·7974	7·0372
	1450	6·4859	58·55	3·45	0·5049	6·9908		1583	6·2286	56·50	5·50	0·8048	7·0334
	1451	6.4982	58·50	3·50	0·5123	7·0105		1584	6·2258	56·55	5·45	0·7974	7·0232
	1457	6·4991	58·60	3·40	0·4976	6·9967		1590	6·2174	56·65	5·35	0·7828	7·0002
	1458	6·4738	58·65	3·35	0·4903	6·9641		1591	6·2174	56·65	5·35	0·7828	7·0002
	1464	6·4874	58·65	3·35	0·4903	6·9777		1597	6·2291	56·70	5·30	0·7755	7·0046
3	1465	6·0984	57·15	4·85	0·7097	6·8081		1598	6·2249	56·70	5·30	0·7755	7·0004
	1471	6·1058	57·20	4·80	0·7024	6·8082		1604	6·1952	56·80	5·20	0·7609	6·9561
	1472	6·1206	57·20	4·80	0·7024	6·8230		1605	6·1997	56·75	5·25	0·7682	6·9679
	1478	6·1452	57·30	4·70	0·6878	6·8330		1611	6·1847	56·80	5·20	0·7609	6·9456
	1479	6·1408	57·30	4·70	0·6878	6·8286		1612	6·1769	56·95	5·05	0·7389	6·9158
	1485	6·1535	57·40	4·60	0·6732	6·8267		1618	6·2274	56·95	5·05	0·7389	6·9663
	1486	6·1416	57·40	4·60	0·6732	6·8148		1619	6·1857	57·15	4·85	0·7098	6·8955
	1492	6·1769	57·60	4·40	0·6439	6 8208		1625	6·1749	57·25	4·75	0·6951	6·8700
	1493	6·2034	57·65	4·35	0·6366	6·8400		1626	6·1609	57·30	4·70	0·6878	6·8487
	1499	6·2160	57·70	4·30	0·6293	6·8453		1632	6·1811	57·35	4·65	0·6805	6·8616
	1500	6·2420	58 10	3·90	0·5708	6·8128		1633	6·1831	57·35	4·65	0·6805	6·8636
	1506	6·2326	58·15	3·85	0·5635	6·7961		1639	6·1977	57·40	4·60	0·6732	6·8709
	1507	6·2259	58·10	3·90	0·5708	6·7967		1640	6·2030	57·40	4·60	0·6732	6·8762
	1513	6·2407	58·15	3·85	0·5635	6·8042		1646	6·1548	57·55	4·45	0·6512	6·8060
	1514	6·2316	58·20	3·80	0·5562	6·7878		1647	6·1749	57·50	4·50	0·6585	6·8334
	1520	6·2224	58·30	3·70	0·5415	6·7639		1653	6·2179	57·60	4·40	0·6439	6·8618
	1521	6·2524	58·40	3·60	0·5269	6·7793		1654	6·2106	57·65	4·35	0·6366	6·8472
	1527	6·2643	58·40	3·60	0·5269	6·7912		1660	6·1802	57·80	4·20	0·6146	6·7948
4	1528	6·1735	57·45	4·55	0·6658	6·8393	8	1661	6·3037	57·75	4·25	0·6219	6·9256
	1534	6·1909	57·45	4·55	0·6658	6·8567		1667	6·2829	57·85	4·15	0·6073	6·8902
	1535	6·2076	57·45	4·55	0·6658	6·8734		1668	6·2741	57·85	4·15	0·6073	6·8814
	1541	6·1967	57·45	+ 4·55	+0·6658	6·8625		1674	6·2570	58·05	+ 3·95	+0·5781	6·8351

Expansion for 1° = 0·0007316 inch = 0·14632 revolutions. 1 revolution of the Micrometer = ·005 inch.

Abstract of the Comparisons of the Compensation Bars with the Standard B, reduced to 62° Fahrenheit: made during the measurement of the Base-line.

DATE.	Excess of each Compensation Bar above the Standard Bar.						Sums.	Temperatures of	
	A	B	C	D	E	G		Bar.	Air.
1840.	div.	div.	div.	div.	div.	div.	div.	°	°
October 12	− 0·4	103·4	85·1	+ 11·9	75·0	+ 4·5	279·5	64·8	
13	+ 9·5	95·4	72·1	− 22·6	38·0	− 20·2	172·2	67·6	73·7
	− 7·5	77·1	68·7	− 7·9	60·0	− 2·7	187·7	69·8	74·5
	+ 33·8	106·6	92·7	+ 1·7	77·1	+ 9·8	321·7	71·2	74·0
14	+ 28·4	112·1	111·0	+ 7·3	77·2	8·9	344·9	63·9	68·7
	− 4·8	105·3	85·8	− 8·9	68·2	+ 2·6	248·2	66·0	70·7
	+ 1·1	97·9	51·7	− 21·6	29·2	− 36·7	121·6	71·0	73·5
15	34·1	121·0	96·3	+ 13·0	79·1	+ 7·5	351·0	63·8	68·1
	8·8	113·9	76·3	− 2·7	44·0	− 7·7	232·6	65·1	70·1
	38·2	110·2	100·7	− 19·5	40·9	− 24·2	246·3	67·0	71·7
	2·1	74·7	73·6	− 14·4	57·6	− 26·3	167·3	68·4	72·5
30	+ 45·2	115·6	120·4	+ 80·6	23·6	+ 2·8	388·2	65·2	66·4
Mean ...	15·71	102·77	86·20	1·41	55·82	− 6·81	255·10		
November 13	+ 31·2	120·5	98·8		102·8	+ 13·2	366·5	67·0	
18	+ 25·1	111·8	112·6		111·8	+ 4·5	365·8	66·3	73·7
19	− 0·3	95·7	98·5		98·2	− 6·6	285·5	78·9	80·7
30	+ 36·6	127·9	130·1		128·7	+ 24·3	447·6	62·0	64·6
	32·6	112·9	122·5		112·6	32·1	412·7	62·8	66·5
	32·2	125·1	111·5		105·9	20·3	395·0	65·4	68·8
	+ 38·2	129·5	125·0		122·9	+ 14·0	429·6	66·6	68·4
Mean ...	27·95	117·63	114·14		111·84	14·54	386·10		
December 16	23·6	105·5	97·4		102·1	4·1	332·7	61·5	73·9
	31·8	104·0	111·0		104·0	10·9	361·7	64·1	75·6
	20·8	112·2	106·7		104·1	9·1	352·9	67·0	76·6
Mean ...	25·40	107·24	105·03		103·40	8·03	349·10		
December 22	30·4	123·9	118·9		115·4	21·5	410·1	61·9	68·7
1841.—Jan. 6	37·7	114·6	105·0		106·2	21·4	384·9	64·7	73·9
	35·3	130·0	137·7		129·6	25·7	458·3	65·8	75·6
9	9·4	110·7	109·8		112·9	23·9	366·7	75·7	71·6
10	11·1	104·3	111·8		110·1	26·7	364·0	66·4	77·9
	40·6	133·9	132·9		120·5	27·0	454·9	68·2	86·5
	38·8	138·4	141·2		111·4	43·6	473·4	75·3	71·6
	47·7	123·3	112·7		122·6	29·9	436·2	74·1	69·1
11	32·4	116·2	112·9		112·5	23·6	397·6	58·3	56·3
13	13·3	103·8	93·7		80·4	1·9	293·1	83·5	99·1
	30·4	106·2	96·2		77·9	21·8	332·5	84·3	99·1
	12·3	112·4	104·6		83·4	− 2·8	309·9	89·4	93·4
	19·7	101·8	108·0		93·4	16·0	338·9	89·6	93·0
Mean ...	27·62	116·89	114·26		105·87	21·55	386·19		
January 20	21·6	121·2	107·8		91·5	29·0	371·1	73·3	75·1
	23·6	125·4	106·8		73·8	24·9	354·5	73·2	75·1
22	17·7	109·5	103·7		99·8	21·9	352·6	84·8	84·1
	37·3	112·5	115·9		110·1	10·2	386·0	84·6	83·4

Abstract of the Comparisons of the Compensation Bars with the Standard B, reduced to 62° Fahrenheit: made during the measurement of the Base-line—continued.

DATE.	EXCESS OF EACH COMPENSATION BAR ABOVE THE STANDARD BAR.					SUMS.	TEMPERATURES OF	
	A	B	C	E	G		Bar.	Air.
1841.	div.	div.	div.	div.	div.	div.	°	°
January 23	46·8	112·2	124·6	131·9	28·2	443·7	67·7	68·8
	22·2	111·3	100·8	121·4	31·7	387·4	67·6	69·6
24	53·8	113·5	115·9	107·2	1·7	392·1	74·4	74·7
	25·8	137·7	132·4	107·4	28·8	432·1	74·4	73·4
25	4·9	100·7	113·2	137·9	5·5	362·2	64·6	63·5
	18·9	116·8	97·9	133·3	9·1	376·0	64·4	63·8
26	13·9	132·3	110·4	119·6	33·7	409·9	59·7	65·9
	29·7	132·3	129·2	116·0	29·4	436·6	59·8	67·1
27	9·0	113·5	125·2	117·9	25·5	391·1	64·3	67·4
	19·6	128·4	127·0	114·6	37·9	427·5	64·4	67·8
28	11·2	129·8	129·2	121·4	23·8	415·4	62·1	61·3
	23·5	130·3	133·8	118·7	21·7	428·0	62·0	63·9
	22·2	123·2	122·3	116·8	38·9	423·4	78·9	82·0
	20·3	105·7	114·5	110·5	21·2	372·2	79·0	81·3
29	27·7	131·8	119·2	96·7	17·6	393·0	81·8	88·5
	43·2	131·3	121·0	108·5	19·4	423·4	82·0	88·0
	28·4	116·3	120·7	106·5	16·8	388·7	82·8	82·6
	31·2	120·9	119·0	115·6	15·1	401·8	82·8	80·6
31	21·4	116·4	116·7	86·8	3·7	345·0	81·4	84·0
	22·2	113·7	117·3	105·4	15·2	373·8	81·5	83·3
February 3	22·9	108·6	105·8	116·7	13·4	367·4	79·9	76·6
	27·5	102·0	108·5	118·6	14·1	370·7	79·7	75·5
4	12·3	101·8	101·1	95·5	— 4·3	306·4	79·2	85·0
	21·1	94·4	106·3	102·3	2·6	326·7	79·6	84·5
	21·8	95·5	121·2	114·9	21·4	374·8	79·9	83·3
	15·1	109·3	102·0	100·6	11·8	338·8	80·0	82·5
7	18·4	96·4	117·2	98·8	8·2	339·0	75·6	78·4
	28·2	117·2	119·1	106·4	13·9	384·8	75·6	77·5
	22·9	107·0	103·2	107·5	19·6	360·2	75·5	76·4
	20·8	109·5	105·3	103·2	6·1	344·9	75·4	76·3
8	31·1	121·0	122·6	113·3	24·6	412·6	57·3	57·1
	30 5	119·9	119·8	111·2	24·0	405·4	59·0	70·4
	35·9	116·4	113·1	108·9	25·7	400·0	59·4	72·4
Mean ...	24·25	115·83	115·40	109·92	18·70	384·30		
February 11	12·9	111·7	103·5	100·7	— 5·2	323·6	77·5	77·9
12	22 2	114·3	107·2	102·3	— 1·5	341·5	67·0	61·0
	30·5	121·1	107·1	108·6	8·5	375·8	66·7	60·2
13	39·3	128·7	119·4	116·6	18·3	422·3	67·0	
	36·3	123·0	127·8	118·4	10·6	416·1	66·6	
	8·9	109·6	94·4	113·3	7·4	333·6	85·9	85·8
	16·9	99·1	90·0	115·1	3·8	324·9	85·9	85·4
14	20·0	102·8	92·5	103·0	3·4	321·7	79·1	86·1
	8·7	106·9	86·6	97·1	2·6	301·9	79·5	85·7
	12·9	105·4	87·7	104·4	0·6	311·0	79·8	85·2
16	17·7	92·5	104·8	104·2	3·7	322·9	86·1	81·5
	22·4	90·2	108·9	101·1	13·2	335·8	85·8	80·2
17	6·1	105·8	97·2	83·7	— 3·3	289·5	71·2	84·8
	23·8	112·1	106·2	89·4	— 3·9	327·6	72·1	85·6
	10·6	100·9	88·3	92·7	— 23·4	269·1	79·9	81·0

Abstract of the Comparisons of the Compensation Bars with the Standard B, reduced to 62° Fahrenheit: made during the measurement of the Base-line.

DATE.		EXCESS OF EACH COMPENSATION BAR ABOVE THE STANDARD BAR.					SUMS.	TEMPERATURES OF	
		A	B	C	E	G		Bar.	Air.
1841.		div.	div.	div.	div.	div.	div.	°	°
February	18	22·2	104·4	108·2	98·7	6·2	339·7	67·9	64·4
		19·5	112·3	103·6	104·0	8·2	347·6	67·7	64·7
Mean ...		19·47	108·28	101·97	103·13	2·89	335·74		
February	22	18·0	106·9	100·3	89·6	8·3	323·1	71·5	82·2
		16·8	109·0	88·5	80·4	3·6	298·3	73·8	84·3
	23	29·8	109·7	105·3	91·3	6·7	342·8	78·4	76·4
		25·6	107·8	97·5	97·9	1·7	330·5	78·1	73·5
	24	36·9	106·9	113·8	103·6	9·1	370·3	82·4	81·7
	25	39·4	116·3	129·4	117·1	26·6	428·8	70·2	56·8
		30·8	106·1	109·5	97·7	9·9	354·0	74·8	80·5
		34·9	108·3	111·7	98·2	8·0	361·1	75·4	78·1
	26	50·4	122·7	128·3	112·3	16·7	430·4	64·3	58·1
		27·8	96·8	104·3	96·5	— 4·4	321·0	81·2	80·6
		34·4	109·1	112·9	104·9	6·9	368·2	81·0	78·7
	27	35·2	120·4	123·9	112·3	31·1	422·9	61·6	58·2
		34·7	119·5	119·2	108·0	29·0	410·4	61·3	60·1
		35·3	115·1	116·7	101·4	17·9	386·4	73·5	78·2
		33·6	110·6	115·7	102·3	16·5	378·7	74·0	76·4
	28	16·8	105·3	98·8	80·8	11·5	313·2	81·2	88·0
		19·5	102·1	99·7	75·3	1·6	298·2	81·9	87·6
March	1	30·0	113·7	114·5	106·5	17·9	382·6	73·4	67·9
		31·6	114·3	115·4	108·1	15·6	385·0	73·0	70·7
	2	31·3	107·0	105·8	96·6	2·7	343·4	89·1	93·9
		27·6	101·6	105·6	91·5	— 0·7	325·6	89·6	93·4
	5	44·5	121·4	131·1	105·8	31·2	444·0	63·6	61·2
		33·1	118·5	111·1	104·9	21·0	388·6	73·7	69·2
	6	31·9	126·9	121·1	104·4	26·4	410·7	60·7	59·8
		44·8	122·3	125·4	109·6	32·4	434·5	60·7	62·8
	11	38·1	119·8	116·8	111·9	25·4	412·0	65·7	66·3
	12	39·5	119·0	124·9	125·4	40·0	448·8	56·1	53·8
Mean ...		32·31	112·48	112·86	101·64	15·28	374·57		
March	17	46·1	125·8	130·0	118·2	27·6	447·7	69·4	61·6
		37·5	113·7	115·6	109·7	15·8	392·3	73·8	83·2
		29·0	107·5	110·3	109·4	5·9	362·1	74·7	80·0
	18	28·2	110·4	92·7	84·7	0·5	316·5	88·1	98·8
	19	26·6	117·3	117·5	115·7	17·4	394·5	63·4	63·6
		25·8	113·4	91·8	82·3	0·2	313·5	84 8	96·6
	21	28·4	112·5	105·4	94·3	13·9	354·5	69·7	75·2
		25·0	115·2	98·0	85·4	7·6	331·2	75·4	82·2
		29·0	107·6	99·1	92·2	3 9	331·8	79·7	80·0
		29·7	108·2	106·8	101·9	11·6	358·2	76·0	72·2
	23	29·3	115·1	104·0	98·4	19·4	366·2	68·2	72·0
	24	32·5	115·3	105·7	103·4	7·4	364·3	73·2	72·4
	28	37·4	119·8	117·6	104·8	23·7	403·3	61·9	63·8
		29·3	115·0	109·6	96·2	11·8	361·9	71·6	71·4
April	5	34·3	118·0	112·4	110·1	15·7	390·5	68·9	69·3
	22	31·0	112·8	109·9	92·9	16·1	362·7	70·7	73·1

BASE-LINE.—TABLE XII.

Abstract of the Comparisons of the Compensation Bars with the Standard B, reduced to 62° Fahrenheit: made during the measurement of the Base-line—continued.

DATE.	EXCESS OF EACH COMPENSATION BAR ABOVE THE STANDARD BAR.					SUMS.	TEMPERATURES OF	
	A	B	C	E	G		Bar.	Air.
1841.	div.	div.	div.	div.	div.	div.	°	°
April 23	38·3	121·3	116·4	106·5	23·1	405·6	65·6	66·8
Mean ...	31·60	114·65	108·40	100·36	13·04	368·05		
AT THE ROYAL OBSERVATORY, CAPE OF GOOD HOPE.								
August 19	42·81	129·21	122·72	115·51	29·02	439·27	56·6	58·3
20	34·11	126·58	126·43	114·50	28·85	430·47	56·7	57·9
	36·15	123·54	121·18	111·50	26·00	418·37	56·9	58·7
	38·49	129·25	122·74	115·84	23·08	429·40	57·2	59·2
21	42·54	130·39	129·23	117·73	25·43	445·32	57·1	58·3
	40·01	126·36	127·58	114·15	22·51	430·61	57·2	58·9
	37·28	122·90	127·35	111·42	20·78	419·73	57·4	59·1
23	47·54	134·55	131·35	121·58	36·99	472·01	56·4	57·5
	41·56	127·88	128·30	118·08	25·12	440·94	57·7	59·3
	34·36	125·25	123·03	111·07	22·68	416·39	57·8	59·8
25	45·18	130·66	129·50	123·40	28·66	457·40	54·9	56·0
	41·07	132·35	131·43	119·89	30·52	455·26	55·0	57·1
	36·88	126·32	124·31	114·90	22·25	424·66	55·2	57·3
	47·26	127·62	129·81	115·34	28·52	448·55	55·4	57·5
	44·42	127·14	125·48	119·37	28·20	444·61	56·1	57·1
	42·17	128·91	125·51	119·61	25·36	441·56	56·1	57·3
	40·41	124·30	126·60	116·82	22·34	430·47	56·3	57·7
	42·75	127·05	125·96	114·60	25·66	436·02	56·5	57·7
26	43·28	133·38	130·96	119·64	33·27	460·53	54·6	55·7
	44·75	134·28	130·78	116·00	26·92	452·73	54·7	56·3
	40·89	129·01	128·16	114·66	27·30	440·02	54·8	56·7
	41·49	129·60	132·08	117·92	31·89	452·98	54·9	56·9
	40·55	128·08	129·27	115·00	25·43	438·33	55·1	57·1
	43·81	126·93	128·21	112·87	26·16	437·98	55·3	57·3
28	43·96	128·17	124·48	113·74	25·01	435·36	56·2	56·9
	42·45	130·37	128·91	116·46	28·42	446·61	56·4	57·7
	32·97	124·08	120·77	110·03	24·42	412·27	56·5	57·9
	39·30	121·39	125·82	112·70	22·77	421·98	56·7	58·0
	41·35	126·58	126·69	113·85	25·55	434·02	57·0	57·5
	41·19	125·31	124·72	116·85	35·18	443·25	57·1	57·9
30	39·69	131·54	130·01	117·45	29·76	448·45	54·7	55·8
	43·55	128·87	131·56	115·58	27·47	447·03	54·8	56·5
	42·97	131·30	126·22	116·11	29·87	446·47	55·0	56·9
	42·26	130·69	129·66	116·13	26·31	445·05	55·1	57·0
	44·44	132·48	133·69	117·24	27·80	455·65	55·7	56·9
	44·28	130·18	130·97	117·56	25·33	448·32	55·7	57·4
	37·91	129·52	126·23	112·75	24·70	431·11	55·9	57·6
	41·70	128·44	128·32	115·74	26·33	440·53	56·1	57·8
	41·08	128·62	126·86	112·37	28·16	437·09	56·1	58·0
September 1	42·54	129·37	127·88	117·69	28·76	446·24	56·1	57·2
	41·03	127·61	129·80	116·27	25·88	440·59	56·0	57·7
	39·93	129·25	128·35	115·25	29·86	442·64	56·2	58·2
	41·34	128·99	124·20	114·22	24·47	433·22	56·5	58·6

Abstract of the Comparisons of the Compensation Bars with the Standard B, reduced to 62° Fahrenheit: made at the Royal Observatory, Cape of Good Hope—continued.

DATE.	Excess of each Compensation Bar above the Standard Bar.					Sums.	Temperatures of	
	A	B	C	E	G		Bar.	Air.
1841.	div.	div.	div.	div.	div.	div.	°	°
September 1	41·51	130·34	128·14	115·51	27·33	442·83	56·9	58·5
	38·35	132·05	127·71	117·24	28·26	443·61	57·1	58·4
	44·61	129·58	129·45	117·09	33·52	454·25	57·3	58·7
	43·44	128·26	128·48	116·58	24·54	441·30	57·4	59·0
	39·33	125·33	125·01	115·33	30·52	435·52	57·5	59·1
	38·28	121·08	122·31	114·76	26·52	422·95	57·6	59·1
2	44·48	127·77	128·10	116·82	30·06	447·23	56·6	57·7
	40·00	123·73	123·75	117·03	25·52	430·03	56·7	58·2
Mean ...	41·25	128·28	127·38	115·88	27·16	439·95		

BASE-LINE.—TABLE XIII.

Abstract of the Comparisons of the Compensation Bars with the Cape Standard Bar A, reduced to 62° Fahrenheit: made at the Royal Observatory, Cape of Good Hope.

DATE.	Excess of each Compensation Bar above the Standard Bar.					Sum.	Temperatures of	
	A	B	C	E	G		Bar.	Air.
1841.	div.	div.	div.	div.	div.	div.	°	°
September 2	40·10	126·18	124·89	117·08	28·93	437·18	57·0	58·8
	40·66	131·39	128·07	112·49	29·35	441·96	57·2	59·1
	42·41	129·08	128·09	116·73	27·00	443·31	57·5	59·3
	39·85	127·68	122·87	114·48	26·84	431·72	57·9	59·5
	41·12	120·61	121·01	109·55	19·89	412·18	58·4	59·5
	38·74	127·93	124·62	111·38	23·20	425·87	58·5	59·5
	38·14	121·84	120·80	112·33	28·16	421·27	58·6	59·4
	36·89	125·93	126·25	113·85	26·09	429·01	58·7	59·1
3	40·12	128·19	125·23	118·30	25·87	437·71	57·2	58·6
	42·54	127·64	124·00	115·56	29·93	439·67	57·3	59·0
	40·98	128·27	127·47	114·31	30·11	441·14	57·4	59·3
	40·25	126·65	125·80	113·15	29·86	435·71	57·5	59·4
	42·14	123·78	120·88	112·00	27·30	426·10	57·7	59·5
	40·23	128·23	122·88	114·05	27·98	433·37	58·2	59·0
	42·56	123·99	125·16	111·88	25·88	429·47	58·2	59·4
	38·89	125·20	123·20	114·41	24·89	426·59	58·3	59·6
	40·86	122·92	124·44	111·03	22·32	421·57	58·4	59·3
4	44·65	127·94	125·49	113·52	27·03	438·63	57·5	58·9
	40·42	126·65	124·55	110·04	26·68	428·34	57·6	59·3
	39·57	121·28	122·77	114·08	24·90	422·60	58·0	59·0
	42·37	125·14	125·55	114·18	25·03	432·27	58·1	59·1
	44·74	127·50	123·41	116·54	29·84	442·03	58·1	59·3
	39·42	125·77	123·37	112·31	27·19	428·06	58·2	59·5
7	41·18	127·77	126·86	118·30	28·05	442·16	56·6	56·9
	44·98	129·63	129·42	118·40	34·90	457·33	56·7	57·4
	43·57	126·45	128·40	112·83	32·15	443·40	56·7	57·6
	40·87	128·67	124·40	115·75	31·44	441·13	56·8	57·8
	44·22	132·36	129·88	115·41	29·38	451·25	56·8	58·0
	47·71	129·12	124·42	114·70	30·60	446·55	57·0	58·1
	43·31	129·99	125·59	118·67	28·01	445·57	57·3	57·9
	42·26	130·85	127·05	117·26	31·60	449·02	57·4	58·2
	40·66	128·87	123·68	113·48	25·96	432·65	57·4	58·5
	38·70	127·64	123·82	113·25	25·59	429·00	57·5	58·8
	40·95	125·28	126·47	110·82	26·39	429·91	57·6	58·9
	37·61	125·06	122·41	111·74	25·22	422·04	57·8	59·1
8	38·33	122·56	119·54	112·51	21·27	414·21	57·9	59·3
	47·26	123·41	126·73	118·51	23·73	439·64	59·0	59·8
Means of 37 sets	41·33	126·69	124·85	114·18	27·26	434·31		

One division of the Micrometer = 0·00005 inch. 434·31 divisions = 0·021716 inch.

NOTE.—The temperatures above given are to the nearest tenth of a degree only.

BASE-LINE.—TABLE XIV.

Abstract of Comparisons of the Cape Standards A and B, made at the Royal Observatory, Cape of Good Hope, and Calculation of their difference in length.

Day and Hour, 1840.	Name of Bar.	Sum of deduced microscope readings.	Mean of Sum of readings for each Bar.	Mean of Bar Therms. (t.)	62°—t.	Expansion in microscope revolutions.	Sum of microscope readings reduced to 62° Fahrt.	A—B in microscope divisions.
h m		r		°	°			div.
Aug. 26, 7·39 a.m.	*A*	4·0187		57·31	+4·69	+0·6859	4·7046	−1·45
7·46	*B*	3·9821		56·96	5·04	0·7370	4·7191	
5· 8 p.m.	*A*	4·1759		57·85	4·15	0·6069	4·7828	+3·65
5·15	*B*	4·0984		57·57	4·43	0·6479	4·7463	
5·47	*A*	4·2019		57·95	4·05	0·5923	4·7942	+4·55
5·53	*B*	4·1272		57·75	4·25	0·6215	4·7487	
,, 28, 4·30	*A*	4·3216		56·97	5·03	0·7356	5·0572	+3·11
	B	4·2686		56·82	5·18	0·7575	5·0261	
,, 29	*A*	4·3059		57·89	4·11	0·6011	4·9070	+1·55
9·13	*B*	4·2685		57·74	4·26	0·6230	4·8915	
,, 31	*A*	4·4251		58·24	3·76	0·5499	4·9750	+2·35
	B	4·3665		58·00	4·00	0·5850	4·9515	
1841.								
Aug. 23, 9·48 a.m.	*B*	6·0102		56·45	5·55	0·8116	6·8218	+6·29
10·46	*A*	6·1096		56·70	5·30	0·7751	6·8847	+2·60
10·53	*B*	6·0763		56·65	5·35	0·7824	6·8587	+3·29
11· 3	*A*	6·1312		56·80	5·20	0·7604	6·8916	+0·91
11· 9	*B*	6·1001		56·65	5·35	0·7824	6·8825	−0·44
11·17	*A*	6·1323		56·90	5·10	0·7458	6·8781	
2·19 p.m.	*A*	6·1869		57·55	4·45	0·6508	6·8377	+1·70
2·25	*B*	6·1553		57·45	4·55	0·6654	6·8207	+5·22
2·33	*A*	6·2221		57·55	4·45	0·6508	6·8729	+6·49
2·40	*B*	6·1572		57·55	4·45	0·6508	6·8080	−0·58
2·50	*A*	6·1587		57·60	4·40	0·6435	6·8022	−0·79
2·56	*B*	6·1593		57·55	4·45	0·6508	6·8101	
Sept. 8, 10·39 a.m.	*A*	6·3675		56·70				
10·40	*A*	6·3607	6·3641	56·70	5·30	0·7751	7·1392	
10·45	*B*	6·2722						+3·39
10·45	*B*	6·2712	6·2717	56·30	5·70	0·8336	7·1053	
10·52	*A*	6·3595						+3·06
10·53	*A*	6·3710	6·3653	56·73	5·27	0·7706	7·1359	
11· 0	*B*	6·2540						+5·47
11· 1	*B*	6·2560	6·2550	56·35	5·65	0·8262	7·0812	
11· 6	*A*	6·3374						+2·78
11· 7	*A*	6·3539	6·3457	56·78	5·22	0·7633	7·1090	
11·13	*B*	6·2504						+3·04
11·14	*B*	6·2689	6·2597	56·40	5·60	0·8189	7·0786	
11·19	*A*	6·3410						+1·63
11·20	*A*	6·3367	6·3389	56·83	5·17	0·7560	7·0949	
11·28	*B*	6·2824						+0·45
11·29	*B*	6·2605	6·2715	56·40	5·60	0·8189	7·0904	
11·34	*A*	6·3621						+1·72
11·35	*A*	6·3468	6·3545	56·85	5·15	0·7531	7·1076	
11·39	*B*	6·3026						+1·02
11·41	*B*	6·2835	6·2931	56·50	5·50	0·8043	7·0974	
11·47	*A*	6·3531						−1·00
11·48	*A*	6·3389	6·3460	56·93	+5·07	+0·7414	7·0874	

BASE-LINE.—TABLE XIV.

Abstract of Comparisons of the Cape Standards A and B, made at the Royal Observatory, Cape of Good Hope, and Calculation of their difference in length—continued.

Day and Hour, 1841.	Name of Bar.	Sum of deduced microscope readings.	Mean of Sum of readings for each Bar.	Mean of Bar Therms. (*t.*)	62°—*t.*	Expansion in microscope revolutions.	Sum of microscope readings reduced to 62° Fahrt.	A—B in microscope divisions.
h m		r		°	°			div.
Sept. 8, 0·12 p.m.	*B*	6·2964						
0·14	*B*	6·2914	6·2939	56·70	+5·30	+0·7751	7·0690	
0·18	*A*	6·3744						+1·60
0·19	*A*	6·3712	6·3728	57·13	4·87	0·7122	7·0850	
0·25	*B*	6·2847						+4·40
0·26	*B*	6·2853	6·2850	56·83	5·17	0·7560	7·0410	
0·33	*A*	6·3107						—2·57
0·34	*A*	6·3101	6·3104	57·18	4·82	0·7049	7·0153	
0·38	*B*	6·2643						+0·34
0·39	*B*	6·2678	6·2661	56·90	5·10	0·7458	7·0119	
Sept. 9, 10· 0 a.m.	*A*	6·2314						
10· 1	*A*	6·2118	6·2216	57·68	4·32	0·6318	6·8534	
10·16	*B*	6·1980						—1·26
10·17	*B*	6·2120	6·2050	57·48	4·52	0 6610	6·8660	
10·23	*A*	6·2855						+4·79
10·24	*A*	6·2699	6·2777	57·65	4·35	0·6362	6·9139	
10·29	*B*	6·2290						+3·16
10·30	*B*	6·2136	6·2213	57·48	4·52	0·6610	6·8823	
10·35	*A*	6·2492						—1·16
10·36	*A*	6·2344	6·2418	57·70	4·30	0·6289	6·8707	
10·40	*B*	6·2174						+0·61
10·41	*B*	6·1956	6·2065	57·50	4·50	0·6581	6·8646	
10·46	*A*	6·3078						+6·35
10·47	*A*	6·2848	6·2963	57·68	4·32	0·6318	6·9281	
10·52	*B*	6·2096						+6·26
10·53	*B*	6·2052	6·2074	57·50	4·50	0·6581	6·8655	
10·58	*A*	6·2807						+2·00
10·59	*A*	6·2560	6·2684	57·78	4·22	0 6171	6·8855	
11· 4	*B*	6·2240						+2·31
11· 5	*B*	6·1934	6·2087	57·53	4·47	0·6537	6·8624	
11·11	*A*	6·2711						+0·81
11·12	*A*	6·2415	6·2563	57·80	4·20	0·6142	6·8705	
11·19	*B*	6·2149						+1·45
11·20	*B*	6·2042	6·2096	57·58	4·42	0·6464	6·8560	
11·37	*A*	6·2819						+0·37
11·38	*A*	6·2528	6·2674	57·95	4·05	0·5923	6·8597	
11·43	*B*	6·1876						+4·90
11·44	*B*	6·1907	6·1892	57·75	4·25	0·6215	6·8107	
11·48	*A*	6·2893						+5·73
11·49	*A*	6·2709	6·2801	57·98	4·02	0·5879	6·8680	
0· 1 p.m.	*B*	6·2438						+3·14
0· 2	*B*	6·2098	6·2268	57·83	4·17	0·6098	6 8366	
0· 6	*A*	6·2828						+0·02
0· 7	*A*	6·2590	6·2709	58·13	3·87	0·5659	6·8368	
0·11	*B*	6·2133						+3·19
0·12	*B*	6·2119	6·2126	57·95	4·05	0·5923	6·8049	
0·17	*A*	6·2923						+3·66
0·18	*A*	6·2880	6·2902	58·23	+3·77	+0·5513	6·8415	

BASE-LINE.—TABLE XIV.

Abstract of Comparisons of the Cape Standards A and B, made at the Royal Observatory, Cape of Good Hope, and Calculation of their difference in length—continued.

Day and Hour, 1841.	Name of Bar.	Sum of deduced microscope readings.	Mean of Sum of readings for each Bar.	Mean of Bar Therms. (t.)	62°—t.	Expansion in microscope revolutions.	Sum of microscope readings reduced to 62° Fahrt.	A—B in microscope divisions.
h m		r		°	°			div.
Sept. 9, 0·23 p.m.	*B*	6·2316						+1·96
0·24	*B*	6·2276	6·2296	57·95	+4·05	+0·5923	6·8219	
0·31	*A*	6·2793						—0·97
0·32	*A*	6·2570	6·2682	58·28	3·72	0·5440	6·8122	
0·36	*B*	6·2449						—0·08
0·37	*B*	6·2258	6·2354	58·05	3·95	0·5776	6·8130	
2·15	*A*	6·2589						
2·16	*A*	6·2479	6·2534	58·58	3·42	0·5001	6·7535	
2·21	*B*	6·2128						+1·77
2·22	*B*	6·2002	6·2065	58·38	3·62	0·5293	6·7358	
2·26	*A*	6·2869						+3·00
2·28	*A*	6·2591	6·2730	58·63	3·37	0·4928	6·7658	
2·33	*B*	6·1922						+3·28
2·34	*B*	6·2152	6·2037	58·38	3·62	0·5293	6·7330	
3·17	*A*	6·2428						
3·18	*A*	6·2302	6·2365	58·70	3·30	0·4826	6·7191	
3·23	*B*	6·1767						+2·63
3·24	*B*	6·1795	6·1781	58·48	3·52	0·5147	6·6928	
3·29	*A*	6·2405						+0·99
3·30	*A*	6·2144	6 2275	58·75	3·25	0·4752	6·7027	
3·36	*B*	6·1998						—0·62
3·37	*B*	6·1797	6·1898	58·45	3·55	0·5191	6·7089	
3·43	*A*	6·2661						+2·88
3·44	*A*	6·2589	6·2625	58·75	3·25	0·4752	6·7377	
3·49	*B*	6·1866						+3·51
3·50	*B*	6·1892	6·1879	58·48	3·52	0·5147	6·7026	
3·54	*A*	6·2379						+1·59
3·55	*A*	6·2486	6·2433	58·75	3·25	0·4752	6·7185	
4· 2	*B*	6·1825						+2·59
4· 3	*B*	6·1878	6·1852	58·53	3·47	0·5074	6·6926	
4·14	*A*	6·2426						+0·38
4·15	*A*	6·2232	6·2329	58·83	3·17	0·4635	6·6964	
4·20	*B*	6·2007						—0·74
4·21	*B*	6·2067	6·2037	58·58	3·42	0·5001	6·7038	
4·26	*A*	6·2814						+3·90
4·27	*A*	6·2830	6·2822	58·85	3·15	0·4606	6·7428	
4·33	*B*	6·1906						+6·23
4·34	*B*	6·1905	6·1906	58·65	3·35	0·4899	6·6805	
4·39	*A*	6·2862						+4·08
4·40	*A*	6·2585	6·2724	58·93	3·07	0·4489	6·7213	
4·44	*B*	6·2022						+2·50
4·45	*B*	6·2105	6·2064	58·65	3·35	0·4899	6·6963	
4·49	*A*	6·2587						+1·34
4·50	*A*	6·2687	6·2637	58·95	3·05	0·4460	6·7097	
4·54	*B*	6·2083						+0·80
4·59	*B*	6·2153	6·2118	58·65	3·35	0·4899	6·7017	
Sept. 10,	*B*	6·1726						
9·45 a.m.	*B*	6·1652	6·1689	56·58	+5·42	+0·7926	6·9615	

BASE-LINE. —TABLE XIV.

Abstract of Comparisons of the Cape Standards A and B, made at the Royal Observatory, Cape of Good Hope, and Calculation of their difference in length—continued.

Day and Hour, 1841.	Name of Bar.	Sum of deduced microscope readings.	Mean of Sum of readings for each Bar.	Mean of Bar Therms. (t.)	62°—t.	Expansion in microscope revolutions.	Sum of microscope readings reduced to 62° Fahrt.	A—B in microscope divisions.
h m		r		°	°			div.
Sept. 10, 9·51 a.m.	*A*	6·1348						−2·02
9·53	*A*	6·1480	6·1414	56·53	+5·47	+0·7999	6·9413	
9·58	*B*	6·1387						+1·06
9·59	*B*	6·1375	6·1381	56·58	5·42	0·7926	6·9307	
10· 4	*A*	6·1962						+5·60
10· 6	*A*	6·1773	6·1868	56·53	5·47	0·7999	6·9867	
	B	6·1740						+1·40
	B	6·1716	6·1728	56·53	5·47	0·7999	6·9727	
10·18	*A*	6·2428						+5·55
10·20	*A*	6·2284	6·2356	56·58	5·42	0·7926	7·0282	
	B	6·1946						+5·69
10·25	*B*	6·1628	6·1787	56·58	5·42	0·7926	6·9713	
10·30	*A*	6·2265						+3·45
10·32	*A*	6·2056	6·2161	56·60	5·40	0·7897	7·0058	
10·37	*B*	6·1864						+4·06
10·39	*B*	6·1646	6·1755	56·60	5·40	0·7897	6·9652	
10·44	*A*	6·2392						+4·57
10·45	*A*	6·2031	6·2212	56·60	5·40	0·7897	7·0109	
10·50	*B*	6·1450						+8·64
10·51	*B*	6·1245	6·1348	56·60	5·40	0·7897	6·9245	
10·55	*A*	6·2192						+7·27
10·57	*A*	6·2104	6·2148	56·65	5 35	0·7824	6 9972	
11· 1	*B*	6·1498						+7·90
11· 4	*B*	6·1305	6·1402	56·68	5·32	0·7780	6·9182	
11· 8	*A*	6·1865						+3·71
11·10	*A*	6·1739	6·1802	56·70	5·30	0·7751	6·9553	
11·15	*B*	6·1666						+2·55
11·16	*B*	6·1428	6·1547	56·70	5·30	0·7751	6·9298	
11·21	*A*	6·1950						+2·32
11·26	*A*	6·1902	6·1926	56·80	5·20	0·7604	6·9530	
11·27	*B*	6·1667						+4·37
11·28	*B*	6·1311	6·1489	56·80	5·20	0·7604	6·9093	
11·32	*A*	6·2104						+5·80
11·33	*A*	6·2034	6·2069	56·80	5 ·2 0	0·7604	6·9673	
11·38	*B*	6·1834						+3·32
11·40	*B*	6·1640	6·1737	56·80	5·20	0·7604	6·9341	
11·45	*A*	6·2189						+2·53
11·46	*A*	6·2082	6·2136	50·90	5 10	0·7458	6·9594	
11·50	*B*	6·1893						+4·00
11·51	*B*	6·1578	6·1736	56·90	5·10	0·7458	6·9194	
11·55	*A*	6·1721						−0·35
11·57	*A*	6·1827	6·1774	56·95	5·05	0·7385	6·9159	
0·12 p.m.	*B*	6 1917						
0·13	*B*	6·1939	6·1928	57·00	5·00	0·7312	6·9240	
0·17	*A*	6·2426						+2·77
0·18	*A*	6·2275	6·2351	57·10	4·90	0·7166	6·9517	
0·22	*B*	6·1563						+6·92
0·24	*B*	6·1609	6·1586	57·05	+4·95	+0·7239	6·8825	
0·27	*A*	6·2458						+6·24

Abstract of Comparisons of the Cape Standards A and B, made at the Royal Observatory, Cape of Good Hope, and Calculation of their difference in length—continued.

Day and Hour, 1841.		Name of Bar.	Sum of deduced microscope readings.	Mean of Sum of readings for each Bar.	Mean of Bar Therms. (*t.*)	62°—*t*.	Expansion in microscope revolutions.	Sum of microscope readings reduced to 62° Fahrt.	A—B in microscope divisions.
	h m		r		°	°			div.
Sept. 10,	0·29 p.m.	*A*	6·2196	6·2327	57·13	+4·87	+0·7122	6·9449	
	0·35	*B*	6·1922						+4·75
	0·38	*B*	6·1694	6·1808	57·10	4·80	0·7166	6·8974	
	0·43	*A*	6·2107						+0·32
	0·44	*A*	6·1864	6·1986	57·20	4·80	0·7020	6·9006	
	2·23	*B*	6·1470						
	2·25	*B*	6·1555	6·1513	57·50	4·50	0·6581	6·8094	
	2·29	*A*	6·1755						+1·88
	2·31	*A*	6·1734	6·1745	57·53	4·47	0·6537	6·8282	
	2·35	*B*	6·1563						+1·69
	2·36	*B*	6·1501	6·1532	57·50	4·50	0·6581	6·8113	
	2·41	*A*	6·2109						+3·63
	2·42	*A*	6·2060	6·2085	57·63	4·37	0·6391	6·8476	
	2·47	*B*	6·1399						+4·16
	2·49	*B*	6·1558	6·1479	57·50	4·50	0·6581	6·8060	
	2·55	*A*	6·2465						+5·91
	2·56	*A*	6·2113	6·2289	57·65	4·35	0·6362	6·8651	
	2·59	*B*	6·1770						+4·52
	3· 0	*B*	6·1463	6·1618	57·50	4·50	0·6581	6·8199	
	3· 5	*A*	6·1767						−1·91
	3· 6	*A*	6·1525	6·1646	57·65	4·35	0·6362	6·8008	
	3·12	*B*	6·1690						−1·14
	3·13	*B*	6·1538	6·1614	57·55	4·45	0·6508	6·8122	
	3·17	*A*	6·2397						+4·58
	3·18	*A*	6·2185	6·2291	57·70	4·30	0·6289	6·8580	
	3·26	*B*	6·1727						+5·49
	3·27	*B*	6·1465	6·1596	57·60	4·40	0·6435	6·8031	
	3·32	*A*	6·2220						+3·32
	3·34	*A*	6·2017	6·2119	57·73	4·27	0·6244	6·8363	
	3·38	*B*	6·1621						+5·17
	3·39	*B*	6·1200	6·1411	57·60	4·40	0·6435	6·7846	
	3·43	*A*	6·1696						+0·09
	3·45	*A*	6·1583	6·1640	57·75	4·25	0·6215	6·7855	
	3·49	*B*	6·1615						−0·48
	3·50	*B*	6·1408	6·1512	57·63	4·37	0·6391	6·7903	
	3·54	*A*	6·2262						+4·70
	3·55	*A*	6·2200	6·2231	57·80	4·20	0·6142	6·8373	
	4· 2	*B*	6·1384						+7·62
	4· 3	*B*	6·1260	6·1322	57·70	4·30	0·6289	6·7611	
	4· 7	*A*	6·2396						+8·50
	4· 9	*A*	6·2242	6·2319	57·80	4·20	0·6142	6·8461	
	4·14	*B*	6·1620						+6·39
	4·15	*B*	6·1535	6·1578	57·73	4·27	0·6244	6·7822	
	4·20	*A*	6·2221						+3·18
	4·21	*A*	6·2067	6·2144	57·90	4·10	0·5996	6·8140	
	4·25	*B*	6·1738						+3·61
	4·27	*B*	6·1478	6·1608	57·78	4·22	0·6171	6·7779	
	4·31	*A*	6·2338						+5·18
	4·32	*A*	6·2264	6·2301	57·90	+4·10	+0·5996	6·8297	

BASE-LINE.—TABLE XIV.

Abstract of Comparisons of the Cape Standards A and B, made at the Royal Observatory, Cape of Good Hope, and Calculation of their difference in length—continued.

Day and Hour, 1841.	Name of Bar.	Sum of deduced microscope readings.	Mean of Sum of readings for each Bar.	Mean of Bar Therms. (*t.*)	62°—*t.*	Expansion in microscope revolutions.	Sum of microscope readings reduced to 62° Fahrt.	A—B in microscope divisions.
h m		r		°	°			div.
Sept. 10, 4·37 p.m.	*B*	6·1841						+4·42
4·38	*B*	6·1585	6·1713	57·80	+4·20	+0·6142	6·7855	
4·43	*A*	6·2076						+0·93
4·44	*A*	6·1973	6·2025	57·95	4·05	0·5923	6·7948	
Sept. 11, 9·34 a.m.	*A*	6·2762						
9·35	*A*	6·2610	6·2686	55·63	6·37	0·9315	7·2001	
9·40	*B*	6·1607						+3·54
9·41	*B*	6·1799	6·1703	55·20	6·80	0·9944	7·1647	
9·47	*A*	6·2261						—0·78
9·48	*A*	6·2305	6·2283	55·65	6·35	0·9286	7·1569	
9·53	*B*	6·1791						—1·43
9·54	*B*	6·1745	6·1768	55·20	6·80	0·9944	7·1712	
10· 0	*A*	6·2337						—1·20
10· 1	*A*	6·2275	6·2306	55·65	6·35	0·9286	7·1592	
10· 4	*B*	6·1681						—1·58
10· 5	*B*	6·2018	6·1850	55·23	6·77	0·9900	7·1750	
10· 8	*A*	6·2732						+0·83
10· 9	*A*	6·2450	6·2591	55·68	6·32	0·9242	7·1833	
10·14	*B*	6·1645						+3·52
10·15	*B*	6·1574	6·1610	55·25	6·75	0·9871	7·1481	
10·21	*A*	6·2766						+3·22
10·22	*A*	6·2414	6·2590	55·70	6·30	0·9213	7·1803	
10·26	*B*	6·1599						+3·73
10·27	*B*	6·1665	6·1632	55·30	6·70	0·9798	7·1430	
10·31	*A*	6·2485						+1·79
10·32	*A*	6·2306	6·2396	55·70	6·30	0·9213	7·1609	
10·40	*B*	6·2055						—0·38
10·41	*B*	6·1733	6·1894	55·33	6·67	0·9753	7·1647	
10·45	*A*	6·2847						+2·64
10·46	*A*	6·2697	6·2772	55·75	6·25	0·9139	7·1911	
10·53	*B*	6·1612						+6·84
10·54	*B*	6·1540	6·1576	55·40	6·60	0·9651	7·1227	
10·59	*A*	6·3038						+7·26
11· 0	*A*	6·2823	6·2931	55·83	6·17	0·9022	7·1953	
11· 4	*B*	6·1760						+6·81
11· 5	*B*	6·1570	6·1665	55·43	6·57	0·9607	7·1272	
11· 8	*A*	6·2926						+4·74
11· 9	*A*	6·2726	6·2826	55·90	6·10	0·8920	7·1746	
11·14	*B*	6·1679						+6·65
11·15	*B*	6·1618	6·1649	55·55	6·45	0·9432	7·1081	
11·19	*A*	6·2757						+5·41
11·20	*A*	6·2647	6·2702	55·90	6·10	0·8920	7·1622	
11·25	*B*	6·1977						+3·19
11·26	*B*	6·1910	6·1944	55·60	6·40	0·9359	7·1303	
11·31	*A*	6·2910						+3·15
11·32	*A*	6·2777	6·2844	56·00	6·00	0·8774	7·1618	
0· 7 p.m.	*B*	6·1956						
0· 8	*B*	6·2000	6·1978	55·80	+6·20	+0 9066	7·1044	

Abstract of Comparisons of the Cape Standards A and B, made at the Royal Observatory, Cape of Good Hope, and Calculation of their difference in length—continued.

Day and Hour, 1841.	Name of Bar.	Sum of deduced microscope readings.	Mean of Sum of readings for each Bar.	Mean of Bar Therms. (*t.*)	62°—*t.*	Expansion in microscope revolutions.	Sum of microscope readings reduced to 62° Fahrt.	A—B in microscope divisions.
h m		r		°	°			div.
Sept. 11, 0·13 p.m.	*A*	6·3045						+4·45
0·14	*A*	6·2969	6·3007	56·20	+5·80	+0·8482	7·1489	
0·18	*B*	6·1925						+5·12
0·19	*B*	6·2043	6·1984	55·85	6·15	0·8993	7·0977	
0·24	*A*	6·2994						+2·87
0·25	*A*	6·2715	6·2855	56·25	5·75	0·8409	7·1264	
0·30	*B*	6·2165						+2·01
0·31	*B*	6·2121	6·2143	55·90	6·10	0·8920	7·1063	
0·34	*A*	6·2689						—1·31
0·35	*A*	6·2502	6·2596	56·30	5·70	0·8336	7·0932	
0·39	*B*	6·2225						+0·27
0·40	*B*	6·2037	6·2131	56·00	6·00	0·8774	7·0905	
2·27	*A*	6·2339						
2·28	*A*	6·2300	6·2320	56·50	5·50	0·8043	7·0363	
2·33	*B*	6·1718						+2·64
2·34	*B*	6·1898	6·1808	56·33	5·67	0·8291	7·0099	
2·40	*A*	6·2120						+0·68
2·41	*A*	6·2127	6·2124	56·50	5·50	0·8043	7·0167	
2·45	*B*	6·1610						+1·82
2·46	*B*	6·1778	6·1694	56·33	5·67	0·8291	6·9985	
2·51	*A*	6·2458						+3·31
2·51	*A*	6·2176	6·2317	56·53	5·47	0·7999	7·0316	
2·55	*B*	6·1781						+2·97
2·56	*B*	6·1675	6·1728	56·33	5·67	0·8291	7·0019	
3· 3	*A*	6·2340						+2·71
3· 4	*A*	6·2299	6·2320	56·55	5·45	0·7970	7·0290	
3· 8	*B*	6·1500						+5·90
3· 9	*B*	6·1375	6·1438	56·35	5·65	0·8262	6·9700	
3·13	*A*	6·2195						+3·48
3·14	*A*	6·1961	6·2078	56·55	5·45	0·7970	7·0048	
3·18	*B*	6·1456						+3·55
3·19	*B*	6·1493	6·1475	56·38	5·62	0·8218	6·9693	
3·30	*A*	6·2148						+2·79
3·31	*A*	6·2147	6·2148	56·65	5·35	0·7824	6·9972	
3·35	*B*	6·1662						+2·37
3·36	*B*	6·1518	6·1590	56·43	5·57	0·8145	6·9735	
3·41	*A*	6·2129						+2·30
3·42	*A*	6·2095	6·2112	56·63	5·37	0·7853	6·9965	
3·47	*B*	6·1535						+2·65
3·48	*B*	6·1633	6·1584	56·45	5·55	0·8116	6·9700	
3·52	*A*	6·2429						+3·98
3·53	*A*	6·2119	6·2274	56·65	5·35	0·7824	7·0098	
3·54	*B*	6·1311						+5·31
3·55	*B*	6·1590	6·1451	56·45	5·55	0·8116	6·9567	
4· 5	*A*	6·2380						+4·15
4· 6	*A*	6·2082	6·2231	56·70	5·30	0·7751	6·9982	
4·10	*B*	6·1472						+3·99
4·11	*B*	6·1608	6·1540	56·50	+5·50	+0·8043	6·9583	
4·15	*A*	6·2540						+4·52

BASE-LINE.—TABLE XIV.

Abstract of Comparisons of the Cape Standards A and B, made at the Royal Observatory, Cape of Good Hope, and Calculation of their difference in length—continued.

Day and Hour, 1841.		Name of Bar.	Sum of deduced microscope readings.	Mean of Sum of readings for each Bar.	Mean of Bar Therms. (*t.*)	62°—*t*.	Expansion in microscope revolutions.	Sum of microscope readings reduced to 62° Fahrt.	A—B in microscope divisions.
	h m		r		°	°			div.
Sept. 11,	4·16 p.m.	*A*	6·2118	6·2329	56·73	+5·27	+0·7706	7·0035	
	4·20	*B*	6·1586						+3·70
	4·21	*B*	6·1658	6·1622	56·50	5·50	0·8043	6·9665	
	4·26	*A*	6·2354						+2·88
	4·27	*A*	6·2285	6·2320	56·78	5·22	0·7633	6·9953	
	4·31	*B*	6·1972						+1·55
	4·32	*B*	6·1771	6·1872	56·58	5·42	0·7926	6·9798	
	4·39	*A*	6·2490						+1·36
	4·40	*A*	6·2257	6·2374	56·83	5·17	0·7560	6·9934	
	4·44	*B*	6·1886						+0·91
	4·45	*B*	6·1860	6·1873	56·55	5·45	0·7970	6·9843	
	4·49	*A*	6·2252						—1·94
	4·50	*A*	6·2071	6·2162	56·88	5·12	0·7487	6·9649	
	4·54	*B*	6·1787						+0·02
	4·55	*B*	6·1858	6·1823	56·65	5·35	0·7824	6·9647	
Sept. 14,	9·35 a.m.	*B*	6·3126						
	9·36	*B*	6·2865	6·2996	56·08	5·92	0·8657	7·1653	
	9·41	*A*	6·2969						—2·27
	9·48	*A*	6·3007	6·2988	56·23	5·77	0·8438	7·1426	
	9·51	*B*	6·3015						—0·71
	9·54	*B*	6·2869	6·2942	56·15	5·85	0·8555	7·1497	
	9·57	*A*	6·3386						+2·31
	9·58	*A*	6·3252	6·3319	56·25	5·75	0·8409	7·1728	
	10· 9	*B*	6·2685						+6·70
	10·10	*B*	6·2612	6·2649	56·25	5·75	0·8409	7·1058	
	10·15	*A*	6·3145						+3·26
	10·16	*A*	6·3099	6·3122	56·35	5·65	0·8262	7·1384	
	10·24	*B*	6·2840						+1·98
	10·25	*B*	6·2713	6·2777	56·25	5·75	0·8409	7·1186	
	10·32	*A*	6·3161						+1·38
	10·33	*A*	6·3197	6·3179	56·43	5·57	0·8145	7·1324	
	10·46	*B*	6·2968						+2·07
	10·47	*B*	6·2742	6·2855	56·35	5·65	0·8262	7·1117	
	10·52	*A*	6·3149						+0·66
	10·53	*A*	6·3072	6·3111	56·48	5·52	0·8072	7·1183	
	11·00	*B*	6·2821						+3·36
	11· 1	*B*	6·2641	6·2731	56·45	5·55	0·8116	7·0847	
	11· 8	*A*	6·3500						+5·80
	11· 9	*A*	6·3502	6·3501	56·58	5·42	0·7926	7·1427	
	11·14	*B*	6·2873						+4·88
	11·15	*B*	6·2919	6·2896	56·50	5·50	0·8043	7·0939	
	11·22	*A*	6·3683						+4·29
	11·23	*A*	6·3405	6·3544	56·65	5·35	0·7824	7·1368	
	11·30	*B*	6·3128						+5·37
	11·31	*B*	6·2828	6·2978	56·63	5·37	0·7853	7·0831	
	11·40	*A*	6·3268						—0·48
	11·41	*A*	6·3090	6·3179	56·80	+5·20	+0·7604	7·0783	
	11·49	*B*	6·2939						+3·12

Abstract of Comparisons of the Cape Standards A and B, made at the Royal Observatory, Cape of Good Hope, and Calculation of their difference in length—continued.

Day and Hour, 1841.	Name of Bar.	Sum of deduced microscope readings.	Mean of Sum of readings for each Bar.	Mean of Bar Therms. (t.)	62°—t.	Expansion in microscope revolutions.	Sum of microscope readings reduced to 62° Fahrt.	A—B in microscope divisions.
h m		r		°	°			div.
Sept. 14, 11·50 a.m.	*B*	6·2591	6·2765	56·73	+5·27	+0·7706	7·0471	
0·12 p.m.	*A*	6·3694						
0·13	*A*	6·3520	6·3607	56·95	5·05	0·7385	7·0992	
0·18	*B*	6·2931						+7·10
0·19	*B*	6·2805	6·2868	56·93	5·07	0·7414	7·0282	
0·35	*A*	6·3596						+4·08
0·36	*A*	6·3598	6·3597	57·15	4·85	0·7093	7·0690	
0·44	*B*	6·3106						+2·71
0·45	*B*	6·2962	6·3034	56·95	5·05	0·7385	7·0419	
2·39	*A*	6·2795						
2·40	*A*	6·2917	6·2856	57·60	4·40	0·6435	6·9291	
2·46	*B*	6·2887						−1·21
2·47	*B*	6·2716	6·2802	57·48	4·52	0·6610	6·9412	
2·53	*A*	6·2926						−1·72
2·54	*A*	6·2684	6·2805	57·60	4·40	0·6435	6·9240	
2·59	*B*	6·2682						+0·44
3· 0	*B*	6·2547	6·2615	57·50	4·50	0·6581	6·9196	
3· 7	*A*	6·2886						+0·14
3· 8	*A*	6·2955	6·2921	57·70	4·30	0·6289	6·9210	
3·14	*B*	6·2753						−0·04
3·15	*B*	6·2513	6·2633	57·50	4·50	0·6581	6·9214	
3·30	*A*	6·3103						+0·70
3·31	*A*	6·2887	6·2995	57·70	4·30	0·6289	6·9284	
3·40	*B*	6·2908						+1·16
3·41	*B*	6·2558	6·2733	57·60	4·40	0·6435	6·9168	
3·47	*A*	6·2887						−1·78
3·48	*A*	6·2897	6·2892	57·83	4·17	0·6098	6·8990	
3·54	*B*	6·2680						+0·83
3·55	*B*	6·2497	6·2589	57·68	4·32	0·6318	6·8907	
4· 2	*A*	6·3209						+2·90
4· 3	*A*	6·3192	6·3201	57·90	4·10	0·5996	6·9197	
4· 9	*B*	6·2527						+4·53
4·10	*B*	6·2531	6·2529	57·75	4·25	0·6215	6·8744	
4·19	*A*	6·3040						+0·96
4·20	*A*	6·2648	6·2844	57·90	4·10	0·5996	6·8840	
4·27	*B*	6·2737						+0·23
4·28	*B*	6·2555	6·2646	57·78	4·22	0·6171	6·8817	
4·35	*A*	6·3202						+0·86
4·36	*A*	6·2846	6·3024	57·98	4·02	0·5879	6·8903	
4·44	*B*	6·2721						+3·06
4·45	*B*	6·2422	6·2572	57·88	4·12	0·6025	6·8597	
Sept. 15, 9·36 a.m.	*B*	6·3734						
9·37	*B*	6·3687	6·3711	57·00	5·00	0·7312	7·1023	
9·45	*A*	6·3819						−0·98
9·46	*A*	6·3699	6·3759	57·10	4·90	0·7166	7·0925	
9·53	*B*	6·3788						−0·18
9·54	*B*	6·3561	6·3675	57·03	+4·97	+0·7268	7·0943	
9·56	*A*	6·4436						+4·97

Abstract of Comparisons of the Cape Standards A and B, made at the Royal Observatory, Cape of Good Hope, and Calculation of their difference in length—continued.

DAY AND HOUR, 1841.	Name of Bar.	Sum of deduced microscope readings.	Mean of Sum of readings for each Bar.	Mean of Bar Therms. (*t.*)	62°—*t.*	Expansion in microscope revolutions.	Sum of microscope readings reduced to 62° Fahrt.	A—B in microscope divisions.
h m		r		°	°			div.
Sept. 15, 9·57 a.m.	*A*	6·4258	6·4347	57·15	+4·85	+0·7093	7·1440	
10· 2	*B*	6·3758						+4·54
10· 3	*B*	6·3677	6·3718	57·03	4·97	0·7268	7·0986	
10· 6	*A*	6·4212						+2·32
10· 7	*A*	6·4038	6·4125	57·15	4·85	0·7093	7·1218	
10·11	*B*	6 3706						+3·49
10·12	*B*	6·3553	6·3630	57·05	4·95	0·7239	7·0869	
10·16	*A*	6·4071						+1·74
10·17	*A*	6·3974	6·4023	57·20	4·80	0·7020	7·1043	
10·21	*B*	6·3557						+3·08
10·22	*B*	6·3523	6·3540	57·08	4·92	0·7195	7·0735	
10·26	*A*	6·4152						+3·35
10·27	*A*	6·4093	6·4123	57·25	4·75	0·6947	7·1070	
10·31	*B*	6·3652						+2·21
10·32	*B*	6·3713	6·3683	57·10	4·90	0·7166	7·0849	
10·36	*A*	6·3915						+0·74
10·37	*A*	6·4125	6·4020	57·28	4·72	0·6903	7·0923	
10·42	*B*	6·3932						+0·60
10·43	*B*	6·3753	6·3843	57·20	4·80	0·7020	7·0863	
10·48	*A*	6·4221						—0·08
10·49	*A*	6·4034	6·4128	57·40	4·60	0·6727	7·0855	
10·53	*B*	6·3780						+1·19
10·54	*B*	6·3652	6·3716	57·20	4·80	0·7020	7·0736	
10·58	*A*	6·4040						—0·46
10·59	*A*	6·3886	6·3963	57·40	4·60	0·6727	7·0690	
11· 6	*B*	6·3990						+0·99
11· 7	*B*	6·3737	6·3864	57·40	4·60	0·6727	7·0591	
11·13	*A*	6·4277						+1·59
11·14	*A*	6·4060	6·4169	57·50	4·50	0·6581	7·0750	
11·20	*B*	6·3805						+2·38
11·21	*B*	6·3764	6·3785	57·40	4·60	0·6727	7·0512	
11·33	*A*	6·4126						+1·09
11·34	*A*	6·4245	6·4186	57·60	4·40	0·6435	7·0621	
11·38	*B*	6·4047						+1·14
11·39	*B*	6·3950	6·3999	57·55	4·45	0·6508	7·0507	
11·45	*A*	6·4765						+4·63
11·46	*A*	6·4597	6·4681	57·70	4·30	0·6289	7·0970	
0· 5 p.m.	*B*	6·4009						
0· 6	*B*	6·4029	6·4019	57·70	4·30	0·6289	7·0308	
0·11	*A*	6·4038						—2·30
0·12	*A*	6·3921	6·3980	57·83	4·17	0·6098	7·0078	
0·16	*B*	6·3735						+1·30
0·17	*B*	6·3731	6·3733	57·75	4·25	0·6215	6·9948	
0·21	*A*	6·4264						+2·79
0·22	*A*	6·4197	6·4231	57·90	4·10	0·5996	7·0227	
0·26	*B*	6·3845						+2·44
0·27	*B*	6·3925	6·3885	57·83	4·17	0·6098	6·9983	
0·31	*A*	6·4101						—0·42
0·32	*A*	6·4022	6·4062	57·98	+4·02	+0·5879	6·9941	

Abstract of Comparisons of the Cape Standards A and B, made at the Royal Observatory, Cape of Good Hope, and Calculation of their difference in length—continued.

Day and Hour, 1841.	Name of Bar.	Sum of deduced microscope readings.	Mean of Sum of readings for each Bar.	Mean of Bar Therms. (*t.*)	62°—*t*.	Expansion in microscope revolutions.	Sum of microscope readings reduced to 62° Fahrt.	A—B in microscope divisions.
h m		r		°	°			div.
Sept. 15, 0·36 p.m.	*B*	6·4015						—0·24
0·37	*B*	6·3864	6·3940	57·88	+4·12	+0·6025	6·9965	
0·40	*A*	6.4424						+1·44
0·41	*A*	6·4093	6·4259	58·00	4·00	0·5850	7·0109	
2·42	*B*	6·3652						
2·43	*B*	6·3602	6·3627	58·33	3·67	0·5366	6·8993	
2·48	*A*	6·3521						—2·52
2·49	*A*	6·3521	6·3521	58·43	3·57	0·5220	6·8741	
2·54	*B*	6·3492						—0·08
2·55	*B*	6·3478	6·3485	58·40	3·60	0·5264	6·8749	
3· 1	*A*	6·3451						—1·97
3· 2	*A*	6·3416	6·3434	58·50	3·50	0·5118	6·8552	
3· 6	*B*	6·3191						+1·23
3· 7	*B*	6·3139	6·3165	58·40	3·60	0·5264	6·8429	
3·10	*A*	6·3462						+0·90
3·11	*A*	6·3339	6·3401	58·50	3·50	0·5118	6·8519	
3·14	*B*	6·3205						+1·79
3·15	*B*	6·3035	6·3120	58·43	3·57	0·5220	6·8340	
3·27	*A*	6·3764						+3·40
3·28	*A*	6·3593	6·3679	58·58	3·42	0·5001	6·8680	
3·32	*B*	6·3426						+2·09
3·33	*B*	6·3222	6·3324	58·48	3·52	0·5147	6·8471	
3·40	*A*	6·3132						—4·57
3·41	*A*	6·3185	6·3159	58·68	3·32	0·4855	6·8014	
3·44	*B*	6·3128						—1·51
3·45	*B*	6·2965	6·3047	58·50	3·50	0·5118	6·8165	
3·50	*A*	6·3436						+1·39
3·51	*A*	6·3373	6·3405	58·65	3·35	0·4899	6·8304	
3·56	*B*	6·3131						+0·31
3·57	*B*	6·3266	6·3199	58·53	3·47	0·5074	6·8273	
4· 0	*A*	6·3527						+0·10
4· 1	*A*	6·3387	6·3457	58·70	3·30	0·4826	6·8283	
4·11	*B*	6·3382						+0·84
4·12	*B*	6·3159	6·3271	58·63	3·37	0·4928	6·8199	
4·17	*A*	6·4034						+4·45
4·18	*A*	6·3749	6·3892	58·75	+3·25	+0·4752	6·8644	

ABSTRACT OR DAILY RESULTS DERIVED FROM TABLE XIV.

DATE.		No. of results.	Sum of A—B.	Mean daily value of A—B.	Equivalent in inches.
1840.			div.	div.	
August	26	10	19·70	1·970	·0000985
	28	5	15·55	3·110	·0001555
	29	4	6·20	1·550	·0000775
	31	5	11·75	2·350	·0001175
1841.					
August	23	10	24·69	2·469	·0001234
September	8	14	25·33	1·809	·0000905
	9	39	87·35	2·240	·0001120
	10	49	183·86	3·752	·0001876
	11	51	138·96	2·724	·0001362
	14	34	66·67	1·961	·0000981
	15	43	47·82	1·144	·0000572

Therefore by the comparisons made in 1840, *before* the measurement of the Base, A—B = $\overset{\text{div.}}{2\cdot2167}$ = ·0001108 inch.

And in 1841, *after* the measurement of the Base, A—B = $\overset{\text{div.}}{2\cdot3945}$ = ·0001197 inch.

The relative number of comparisons, however, are very unequal: but both materially disagree with the result of the comparisons made in London, before the Bars were forwarded to the Cape, see page 350.

EXPERIMENTS

MADE

IN LONDON, IN THE YEAR 1839,

UNDER THE

SUPERINTENDENCE OF THE ASTRONOMER ROYAL,

FOR

ASCERTAINING THE THERMETIC EXPANSION OF THE CAPE 10-FEET IRON BARS A AND B, AND THEIR LENGTHS IN RELATION

TO THE

ORDNANCE 10-FEET IRON BARS O_1 AND O_2; ROYAL ASTRONOMICAL SOCIETY'S 5-FEET BRASS TUBULAR SCALE; AND TO MR. SIMM'S 5-FEET BRASS TUBULAR SCALE.

Reductions of the Observations for ascertaining the values of the Micrometer Screws; used in measuring the Expansion of the Cape Bars, and their lengths in relation to other Bars.

Observations made 1839, April 10, by Mr. Main.

Western Microscope.				Eastern Microscope.			
Division on Simms' Scale.	Micrometer Readings.	Mic. intervals corresponding to 0·1 inch.	Value of 1^r.	Division on Simms' Scale.	Micrometer Readings.	Mic. intervals corresponding to 0·1 inch.	Value of 1^r.
in.	r	r	in.	in.	r	r	in.
3·0	95·039	9·977		3·0	90·100	10·061	
2·9	105·016	9·984		2·9	100·161	10·002	
2·8	115·000			2·8	110·163		
2·8	89·917	10·072		2·8	90·154	10·051	
2·7	99·989	10·000		2·7	100·205	10·010	
2·6	109·989			2·6	110·215		
2·6	90·068	10·041		2·6	90·221	10·051	
2·5	100·109	9·996		2·5	100·272	10·023	
2·4	110·105			2·4	110·295		
2·4	90·107	10·032		2·4	90·257	10·048	
2·3	100·139	10·025		2·3	100·305	9·988	
2·2	110·164			2·2	110·293		
2·2	90·085	10·042		2·2	90·331	10·005	
2·1	100·127	10·019		2·1	100·336	9·987	
2·0	110·146			2·0	110·323		
2·0	90·087	10·047		2·0	90·310	10·039	
1·9	100·134	10·037		1·9	100·349	9·951	
1·8	110·171			1·8	110·300		
1·8	90·072	10·060		1·8	90·625	10·036	
1·7	100·132	10·018		1·7	100·661	9·983	
1·6	110·150			1·6	110·644		
1·6	89·979	10·058		1·6	90·100	10·027	
1·5	100·037	9·989		1·5	100·127	9·961	
1·4	110·026			1·4	110·088		
1·4	89·963	10·039		1·4	90·045	10·016	
1·3	100·002	10·013		1·3	100·061	9·987	
1·2	110·015			1·2	110·048		
1·2	89·917	10·044		1·2	90·070	10·019	
1·1	99·961	10·011		1·1	100·089	9·997	
1·0	109·972			1·0	110·086		
Sum 2·0	=	200·504	0·00997486	2·0	=	200·242	0·00998791

The equivalent for W revolutions of western + E revolutions of eastern:

$$= W \times \overset{\text{in.}}{0{\cdot}00997486} + E \times \overset{\text{in.}}{0{\cdot}00998791}$$

$$= (E+W) \times \overset{\text{in.}}{0{\cdot}00998138} + (E-W) \times \overset{\text{in.}}{0{\cdot}00000652}$$

$$= \overset{\text{in.}}{0{\cdot}00998138} \left\{(E+W) + \frac{1}{1531}(E-W)\right\}$$

$$= \overset{\text{in.}}{0{\cdot}01} \times \left(1 - \frac{1}{537}\right) \times \left\{E+W + \frac{1}{1531}(E-W)\right\}$$

1840, August 8.

(Signed) G. B. Airy.

Reduction of the Observations for ascertaining the values of the Micrometer Screws; used in comparing the lengths of the Cape Bars with those of other Bars.

Day, 1839.	Western Microscope.			Eastern Microscope.		
	Division on R. A. Soc. Scale.	Micrometer Readings.	Mic. intervals corresponding to 0·1 inch.	Division on R. A. Soc. Scale.	Micrometer Readings.	Mic. intervals corresponding to 0·1 inch.
	in.	r	r	in.	r	r
April 25	12·0 11·9	95·435 105·353	9·918	12·0 11·9	94·403 104·348	9·945
	12·0 11·9	95·478 105·400	9·922	12·0 11·9	94·450 104·348	9·898
	12·0 11·9	95·485 105·410	9·925	12·0 11·9	94·443 104·322	9·879
	12·0 11·9	95·483 105·410	9·927	12·0 11·9	94·424 104·310	9·886
	12·0 11·9	95·492 105·423	9·931	12·0 11·9	94·429 104·300	9·871
	12·0 11·9	95·490 105·417	9·927	12·0 11·9	94·431 104·307	9·876
April 29	12·0 11·9	95·683 105·667	9·984	12·0 11·9	95·229 105·239	10·010
	12·0 11·9	95·682 105·662	9·980	12·0 11·9	95·239 105·241	10·002
	12·0 11·9	95·695 105·672	9·977	12·0 11·9	95·238 105·235	9·997
	12·0 11·9	95·697 105·670	9·973	12·0 11·9	95·233 105·236	10·003
	12·0 11·9	95·691 105·670	9·979	12·0 11·9	95·238 105·238	10·000
	12·0 11·9	95·690 105·668	9·978	12·0 11·9	95·233 105·232	9·999
	12·0 11·9	95·699 105·672	9·973			
Sum...	1·3	=	129·394	1·2	=	119·366
	0·0100468	=	1^r	0·0100531	=	1^r

Reduction of the Observations made in 1839, *April* 8, *for ascertaining the Thermetic Expansion of Cape Bar B.*

To $6^h\ 30^m$, the Micrometer Observations were made by Mr. MAIN and Mr. W. SIMMS, the Thermometers being read by Mr. SIMMS and Mr. MANN: afterwards the whole was done by Mr. SIMMS and Mr. W. SIMMS.

	TIME.	THERMOMETERS. W.	E.	Mean.	Diff. Mean.	MICROMETERS. W.	E.	E+W −180°.	E−W.	Diff. E+W.	Diff. E−W.	
	h m	°	°	°	°	r	r	r	r	r	r	
	4·20	129·3	132·3	130·8	1·95	98·040	98·746	16·786		0·214		
	4·30	127·3	130·4	128·85	0·60	98·022	98·550	16·572		0·158		
	4·40	127·1	129·4	128·25	2·20	97·878	98·536	16·414		0·249		6 W = 45·320
	4·45	125·0	127·1	126·05	2·7	97·690	98·475	16·165		0·249		6 E = 49·186
6=728·15	5· 0	122·6	124·1	123·35	3·05	97·603	98·313	15·916		0·295		
	5·10	119·8	120·8	120·3	3·6	97·482	98·139	15·621		0·301		
	5·20	116·3	117·1	116·7	3·2	97·398	97·922	15·320		0·250		
	5·30	113·3	113·7	113·5	3·2	97·269	97·801	15·070		0·248		
	5·40	110·2	110·4	110·3	2·35	97·068	97·754	14·822		0·170		
	5·50	108·0	107·9	107·95	2·4	96·973	97·679	14·652		0·205		
6=627·20	6· 0	105·7	105·4	105·55	2·0	96·853	97·594	14·447		0·149		6 W = 40·894
	6·10	103·7	103·4	103·55	2·0	96·770	97·528	14·298		0·182		6 E = 45·347
	6·20	101·3	101·8	101·55	3·25	96·657	97·459	14·116		0·210		
	6·30	98·6	98·0	98·3	10·6	96·573	97·333	13·906		0·818		
	7·30	88·3	87·1	87·7	2·85	96·134	96·954	13·088		0·189		
	7·40	85·4	84·3	84·85	1·4	95·987	96·912	12·899		0·111		
	7·50	84·0	82·9	83·45	1·65	95·915	96·873	12·788		0·101		7 W = 40·507
7=560·05	8· 0	82·3	81·3	81·8	6·45	95·854	96·833	12·687		0·460		7 E = 47·393
	8·50	76·0	74·7	75·35	1·4	95·587	96·640	12·227		0·082		
	9· 0	74·5	73·4	73·95	1·0	95·527	96·618	12·145		0·079		
	9·10	73·6	72·3	72·95	4·3	95·503	96·563	12·066		0·340		
	9·50	69·0	68·3	68·65	1·05	95·345	96·381	11·726		0·074		
	10· 0	67·8	67·4	67·6	0·6	95·312	96·340	11·652		0·055		
	10·10	67·2	66·8	67·0	3·1	95·441	96·156	11·597		0·226		6 W = 32·199
6=392·85	10·50	64·0	63·8	63·9	0·7	95·298	96·073	11·371		0·041		6 E = 36·758
	11· 0	63·2	63·2	63·2	0·7	95·412	95·918	11·330		0·049		
	11· 0	62·6	62·4	62·5	18·75	95·391	95·890	11·281		1·407		Diff. E+W
	19·40	44·2	43·3	43·75		94·724	95 150	9·874				for 1°.
												rev.
		Mean of 6		121·36	16·83	97·553	98·198	15·751	0·645	1·377	−0·097	0·0818
		Mean of 6		104·53	24·52	96·816	97·558	14·374	0·742	1·817	−0·241	0·0741
		Mean of 7		80·01	14·53	95·787	96·770	12·557	0·983	1·064	+0·224	0·0732
		Mean of 6		65·48	21·73	95·367	96·126	11·493	0·759	1·619	+0·333	0·0745
		I		43·75		94·724	95·150	9·874	0·426			

The effect of E−W is insensible.

							in.
Hence, from 121° Fahrenheit	to 105°,	the expansion of	the Bar	for 1° Fahrenheit	=		0·000817
„ 105	„ 80,	„	„	„	=		0·000740
„ 80	„ 65,	„	„	„	=		0·000731
„ 65	„ 44,	„	„	„	=		0·000744

1840, August 8.

(Signed) G. B. AIRY.

Reduction of the Observations made on 1839, *April* 9, *for ascertaining the Thermetic Expansion of Cape Bar A.*

To 3^h 5^m, the Observations were made under Mr. MAIN's direction: after that under Mr. SIMMS's direction.

	TIME.	THERMOMETERS. W.	THERMOMETERS. E.	THERMOMETERS. Mean.	THERMOMETERS. Diff. Mean.	MICROMETERS. W.	MICROMETERS. E.	MICROMETERS. E+W −190°.	MICROMETERS. E−W.	MICROMETERS. Diff. E+W.	MICROMETERS. Diff. E−W.	
	h m	°	°	°	°	r	r	r	r	r	r	
	0·15	139·5	141·7	140·6		99·985	97·703	7·688				
2=277·10	0·25	140·0	142·3	141·15	−0·55	99·818	97·772	7·590		0·098		
	0·35	135·3	136·6	135·95	+5·20	99·865	97·210	7·075		0·515		2 W = 19·683
	0·45	130·0	130·6	130·3	5·65	99·562	97·031	6·593		0·482		2 E = 14·982
	0·55	125·0	124·8	124·9	5·4	99 449	96·710	6·159		0·434		
6=710·65	1· 5	119·4	119·7	119·55	5·35	99·202	96·514	5·716		0·443		
	1·15	115·0	114·0	114·5	5·05	99·035	96·240	5·275		0·441		6 W = 54·944
	1·25	112·1	111·4	111·75	2·75	98·915	96·113	5·028		0·247		6 E = 38·629
	1·35	109·5	109·8	109·65	2·10	98·781	96·021	4·802		0·226		
	1·45	106·9	106·3	106·6	3·05	98·541	96·050	4·591		0·211		
	1·55	102·7	101·7	102·2	4·4	98·416	95·868	4·284		0·307		
	2· 5	100·3	99·4	99·85	2·35	98·313	95·791	4·104		0·180		
	2·15	98·3	97·5	97·9	1·95	98·229	95·732	3·961		0·143		
9=868·50	2·25	96·6	95 6	96·1	1·8	98·170	95·661	3·831		0·130		
	2·35	94·5	93·8	94·15	1·95	98·058	95·610	3·668		0·163		9 W = 73·452
	2·45	92·9	91·8	92·35	1·8	97·970	95·548	3·518		0·150		9 E = 51·157
	2·55	91·0	90·2	90·6	1·75	97·912	95·485	3·397		0·121		
	3· 5	89·1	88·4	88·75	1·85	97·843	95·412	3·255		0·142		
	3·55	82·4	81·9	82·15	6·6	97·648	95·082	2·730		0·525		
	4· 0	81·1	80·2	80·65	1·5	97·589	95·034	2·623		0·107		
	4· 5	79·8	78·9	79·35	1·3	97·537	94·952	2·519		0·104		
	4·10	76·5	77·8	78·15	1·2	97·497	94·949	2·446		0·073		
10=739·85	4·50	74·0	73·3	73·65	4·5	97·272	94·839	2·111		0·335		10 W = 72·845
	5· 0	72·8	72·2	72·5	1·15	97·230	94·805	2·035		0·076		10 E = 48·563
	5·10	71·8	71·2	71·5	1·0	97·182	94·779	1·961		0·074		
	5·50	68·1	68·6	68·35	3·15	97·003	94·713	1·716		0·245		
	6· 0	67·4	67·0	67·2	1·15	96·950	94·706	1·656		0·060		
	6·10	66·4	66·3	66·35	0·85	96·937	94·674	1·611		0·045		
	6·50	63·4	63·0	63·2	3·15	96·789	94·578	1·367		0·244		
	7· 0	62·9	62·5	62·7	0·5	96·771	94·551	1·322		0·045		
	7·10	62·0	61·8	61·9	0·8	96·786	94·485	1·271		0·051		
	7·50	60·0	59·8	59·9	2·0	96 731	94·391	1·122		0·149		9 W = 59·990
9=532·85	8· 0	59·4	59·2	59·3	0·6	96·691	94·384	1·075		0·047		9 E = 39·512
	8·10	59·0	58·8	58·9	0·4	96·653	94·376	1·029		0·046		
	8·50	56·2	56·2	56·2	2·7	96·553	94·264	0·817		0·212		
	9· 0	55·8	55·5	55·65	0·55	96·515	94·254	0·769		0·048		Diff. E+W
	9·10	55·2	55·0	55·1	0·55	96·501	94·229	0·730		0·039		for 1°.
	21·10	45·0	44·7	44·85	10·25	96·453	93·578	0·031		0·699		

	Mean	Diff. Mean	W.	E.	E+W −190°.	E−W.	Diff. E+W.	Diff. E−W.	rev.
Mean of 2	138·55		99·842	97·491	7·333	−2·351			
Mean of 6	118·44	20·11	99·157	96·438	5·595	−2·719	1·738	+0·368*	0·0864
Mean of 9	96·5	21·94	98·161	95·684	3·845	−2·477	1·750	−0·242	0·0798
Mean of 10	73·98	22·52	97·284	94·856	2·140	−2·428	1·705	−0·049	0·0757
Mean of 9	59·21	14·77	96·666	94·390	1·056	−2·276	1·084	−0·152	0·0734
1	44·85	14·36	96·453	93·578	0·031	−2·875	1·025	+0·599	0·0714

								in.
From 139° Fahrenheit to 119°, the expansion of the Bar for 1° Fahrenheit							=	0·000863
„	119	„	97,	„	„	„	=	0·000797
„	97	„	74,	„	„	„	=	0·000756
„	74	„	59,	„	„	„	=	0·000733
„	59	„	45,	„	„	„	=	0·000713

1840, August 8. (Signed) G. B. AIRY.

* This stands ·468 in the original.

Comparisons of Standard Bars.

	Day and Hour, 1839.		Name of Bars.	Thermometers. West.	Thermometers. Centre.	Thermometers. East.	Thermometers. Mean.	Thermometers. Standard Temp.	Excess of Stand.	Micrometers. W.	Micrometers. E.	Micrometers. W + E − 189°.	Equivalent to W+E − 189°.	Correction for excess of Standard.	True measure at Standard temperat^e.
	d	h m		°	°	°	°	°	°	r	r	r	in.	in.	in.
	April 8,	2	S	42·4		42·5	42·45	62·0	19·55	94·867	95·000	0·867	0·00867	·01428	·02295
		2	B	41·5		41·5	41·5		20·5	95·345	94·338	0·683	·00683	·01497	·02180
	,, 9,	7·30	B	44·2		43·3	43·75		18·25	94·724	95·150	0·874	·00874	·01332	·02206
		7·40	S	43·4		43·3	43·35		18·65	94·736	95·150	0·886	·00886	·01362	·02248
	,, 8,	20	S	43·4		43·4	43·4		18·6	95·373	94·547	0·920	·00920	·01358	·02278
		20	A	43·7		43·6	43·65		18·35	95·164	94·712	0·876	·00876	·01340	·02216
	,, 9,	21	A	45·0		44·7	44·85		17·15	96·453	93·578	1·031	·01031	·01252	·02283
		21	S	43·9		44·2	44·05		17·95	96·519	93·480	0·999	·00999	·01311	·02310
												W + E − 199°.	Equivalnt. to W+E−199°.		
33·0	,, 24,	23·20	Ast.	47·2	47·0	47·1	47·1		13·78	100·787	98·866	0·653	·00653	·01733	·02386
				49·7	49·0	49·3	49·33			100·788					
		23·33	Ast.	50·1	49·7	50·5	50·1		11·9	100·837	98·949	0·794	·00794	·01497	·02291
										100·852					
47·8		23·50	A	47·3		47·2	47·25		14·75	100·121	99·819	0·940	·00942	·01077	·02019
										100·053	99·890	0·943			
53·9	,, 25,	0·0	O_2	47·4		47·7	47·55		14·45	99·996	100·095	1·091	·01105	·01055	·02160
										100·010	100·108	1·118			
54·0		0·6	S	46·4		46·3	46·35		15·65	99·970	99·986	0·956	·00964	·01143	·02107
										99·261	100·710	0·971			
		0·29	Ast.	50·7	50·9	51·6	51·07		10·65	100·917	99·133	1·044	·01044	·01339	·02383
				51·4	51·4	52·1	51·63			100·905					
55·0		1·15	A	48·0		48·0	48·0		14·0	101·029	98·955	0·984	·00972	·01022	·01994
										100·952	99·008	0·960			
55·0		1·25	O_2	48·4		48·9	48·65		13·35	100·682	99·537	1·219	·01235	·00975	·02210
										100·775	99·476	1·251			
55·0		1·30	S	47·8		48·2	48·0		14·0	100·846	99·212	1·058	·01067	·01022	·02089
										100·727	99·348	1·075			
55·0		(1·45)	Ast.	51·9	51·2	52·7	52·27		9·58	100·986	99·131	1·117	·01142	·01205	·02347
				52·3	52·3	53·1	52·57			100·997	99·170	1·167			
55·0		2·4	A	48·4		48·6	48·5		13·5	101·270	98·843	1·113	·01088	·00986	·02074
										101·012	99·051	1·063			
55·0		2·10	O_2	49·0		49·6	49·3		12·7	100·958	99·362	1·320	·01314	·00927	·02241
										100·982	99·326	1·308			
55·2		(2·20)	S	48·8		49·1	48·95		13·05	100·618	99·520	1·138	·01134	·00953	·02087
										100·574	99·555	1·129			
55·0		2·35	Ast.	52·0	52·2	52·9	52·37		9·43	100·983	99·207	1·176	·01176	·01186	·02362
				52·6	52·3	53·4	52·77			100·955					

55·5	April 25,	2·47	S	49·2		49·4	49·3		12·7	99·781	100·399	1·180	·01216	·00927	·02143
										99·796	100·456	1·252			
55·5		3·0	A	49·4		49·4	49·4		12·6	100·800	99·303	1·103	·01103	·00920	·02023
										100·800					
55·4		3·5	O_2	49·6		50·3	49·95		12·05	100·375	99·942	1·317	·01317	·00880	·02197
56·0		3·28	Ast.	52·1	52·7	53·4	52·73		9·08	100·926	99·266	1·218	·01218	·01142	·02360
				52·9	52·9	53 5	53·1			100·978					
49·5		23·35	Ast.	48·2	47·9	48·3	48·13		13·72	100·794	98·851	0·649	·00649	·01726	·02375
51·4				48·4	48·2	48·7	48·43			100·803					
53·0		23·45	A	47·6		47·5	47·55		14·45	100·595	99·292	0·887	·00903	·01055	·01958
										100·475	99·443	0·918			
53·1		23·53	O_2	47·3		47·3	47·3		14·7	100·477	99·667	1·144	·01137	·01073	·02210
										100·451	99·678	1·129			
	„ 26,	0·0	S	47·3		47·2	47·25		14·75	100·418	99·606	1·024	·01018	·01077	·02095
			S							100·411	99·600	1·011			
53·2		0·7	A	47·8		47·7	47·75		14·25	100·378	99·644	1·022	·01015	·01040	·02055
			A							100·354	99·653	1·007			
		0·15	O_2	47·7		47·7	47·7		14·3	100·950	99·202	1·152	·01131	·01044	·02175
			O_2							101·086	99·021	1·107			
			O_2							101·081	99·040	1·121			
		0·27	O_2							100·951	99·192	1·143			
		0·35	S	47·7		47·7	47·7		14·3	100·998	99·060	1·058	·01046	·01044	·02090
			S							100·960	99·069	1·029			
			S							100·999	99·051	1·056			
54·1		1·0	Ast.	50·1	50·2	50·6	50·3		11·3	101·901	98·002	0·903	·00881	·01422	·02303
			Ast.	51·0	50·8	51·5	51·1			101·883	97·975	0·858			
54·4		1·22	B	47·6		47·8	47·7		14·3	101·592	98·345	0·937	·00919	·01044	·01963
			B							101·312	98·588	0·900			
54·3		1·42	S	48·7		48·9	48·8		13·2	101·260	98·776	1·036	·01036	·00964	·02000
54·2		1·51	O_1	48·2		48·7	48·45		13·55	100·748	99·398	1·146	·01146	·00989	·02135
54·8		2·10	Ast.	51·3	51·4	52·3	51·67		10·12	100·883	99·147	1·044	·01044	·01273	·02317
55·0			—	52·3	51·5	52·5	52·1			100·911					
		2·30	B	48·3		48·6	48·45		13·55	100·511	99·486	0·997	·00997	·00989	·01986
			B							·457	·539	0·996			
54·7		2·35	S	49·2		49·5	49·35		12·65	100·203	99·884	1·087	·01089	·00924	·02013
			S							·218	·873	1·091			
		2·45	O_1	48·7		49·8	49·25		12·75	100·947	99·323	1·270	·01268	·00931	·02199
			O_1							·965	·361	1·266			
55·1		2·55	Ast.	52·3	52·0	52·6	52·3		9·55	100·985	99·100	1·085	·01085	·01201	·02286
				52·4	52·2	53·2	52·6								
48·8		23·5	Ast.	47·6	47·5	47·9	47·67		14·15	100·757	98·789	0·565	·00565	·01780	·02345
				47·9	47·8	48·4	48·03			·789					
										·783					
51·1		23·15	B	47·3		47·3	47·3		14·7	100·717	99·171	0·888	·00886	·01073	·01959
			B							100·095	99·788	0·883			
51·5		23·30	S	47·3		47·4	47·35		14·65	100·010	99·948	0·958	·00964	·01070	·02034
			S							99·938	·993	0·931			
			S							100·118	·860	0·978			
			S							100·150	·837	0·987			

COMPARISONS OF STANDARD BARS—*continued.*

	Day and Hour, 1839.	Name of Bars.	Thermometers. West.	Thermometers. Centre.	Thermometers. East.	Thermometers. Mean.	Standard Temp.	Excess of Stand.	Micrometers. W.	Micrometers. E.	Micrometers. W + E − 199°.	Equivalent to W+E − 199°.	Correction for excess of Standard.	True measure at Standard temperate.
	d h m		°	°	°	°	°	°	r	r	r	in.	in.	in.
52·2	April 26, 23·47	O_I	47·2		47·6	47·4	62·0	14·6	99·683	100·418	1·101	·01098	·01066	·02164
		O_I							·662	·432	1·094			
53·4	(23·59)	Ast.	49·9	49·7	50·4	50·0		12·0	100·818	98·922	0·742	·00742	·01510	·02252
									·821					
53·6	„ 27, 0·10	B	47·2		47·4	47·3		14·7	100·867	100·035	(1) 0·902	·00909	·01073	·01982
		B							·514	99·394	0·908			
		B							·928	99·988	(1) 0·916			
53·6	0·20	S	48·0		48·2	48·1		13·9	100·907	99·116	1·023	·01022	·01015	·02037
		S							101·140	99·881	1·021			
54·0	0·25	O_I	47·4		48·3	47·85		14·15	100·920	99·161	1·081	·01082	·01033	·02115
		O_I							·914	·168	1·082			
	0·35	Ast.	50·5	50·3	50·8	50·5		11·13	102·138	97·767	0·905	·00948	·01401	·02349
	0·45	Ast.	51·2	50·9	51·5	51·2			102·188	97·803	0·991			
54·3	0·55	B	48·0		48·5	48·25		13·75	101·886	98·052	0·938	·00938	·01004	·01942
		B							101·817	98·121	0·938			
54·4	1·0	S	48·5		48·4	48·45		13·55	101·751	98·339	1·090	·01097	·00989	·02086
		S							101·545	98·559	1·104			
54·5	(1·6)	O_I	48·0		48·5	48·25		13·75	101·655	98·463	1·113	·01127	·01004	·02131
		O_I							101·706	98·429	1·135			
	1·12	Ast.	51·3	51·5	52·4	51·73		10·10	102·223	97·846	1·071	·01071	·01271	·02342
55·0	1·23	Ast.	51·7	51·8	52·7	52·07			102 227					
54·9	1·29	B	48·4		48·9	48·65		13·35	102·122	97·848	0·970	·00971	·00975	·01946
		B							·010	97·961	0·971			
	1·45	S	49·1		49·1	49·1		12·9	101·820	98·305	1·125	·01130	·00941	·02071
		S							·852	·283	1·135			
	1·53	O_I	48·7		49·1	48·9		13·1	102·000	98·182	1·182	·01197	·00956	·02153
		O_I							100·686	99·511	1·197			
		O_I							100·690	99·523	1·213			
	1·59	Ast.	51·7	52·2	53·0	52·3		9·53	102·210	97·898	1·114	·01114	·01199	·02313
55·4	2·12	Ast.	52·2	52·5	53·2	52·63			102·222					
51·0	„ 28, 23·15	O_2	47·3		47·3	47·3		14·7	100·182	99·847	1·029	·01035	·01073	·02108
		O_2							100·182	99·858	1·040			
52·2	23·20	O^I	46·8		46·8	46·8		15·2	100·053	99·973	1·026	·01032	·01110	·02142
		O^I							100·010	100·028	1·038			
52·5	23·26	O^I_2	47·3		47·3	47·3		14·7	99·779	100·295	1·074	·01065	·01073	·02138
		O_2							101·395	98·660	1·055			
53·0	23·34	O_I	46·9		46·9	46·9		15·1	99·227	100·810	1·037	·01051	·01102	·02153
		O^I							99·957	100·100	1·057			
		O_I							99·937	100·122	1·059			

53·0	April 28,	23·40	O_2	47·4		47·4	47·4		14·6	100·352	99·757	1·109	·01121	·01066	·02187
			O_2							98·765	101·365	1·130			
			O_2							98·417	101·708	1·125			
53·0		23·48	O_1	47·1		47·0	47·05		14·95	100·502	99·601	1·103	·01074	·01092	·02166
			O_1							100·853	99·210	1·063			
			O_1							101·063	98·993	1·056			
53·2	„ 29,	0·20	A	47·7		47·8	47·75		14·25	100·745	99·195	0·940	·00949	·01040	·01989
			A							101·058	98·899	0·957			
53·5		0·30	B	47·7		47·5	47·6		14·4	100·564	99·350	0·914	·00917	·01051	·01968
			B							100·719	99·174	0·893			
			B							100·318	99·618	0·936			
			B							100·296	99·627	0·923			
53·3		0·41	A	48·0		48·1	48·05		13·95	99·679	100·320	0·999	·01001	·01018	·02019
			A							99·562	100·440	1·002			
53·7		0·50	B	47·5		47·9	47·7		14·3	99·685	100·260	0·945	·00936	·01044	·01980
			B							99·840	100·080	0·920			
			B							100·101	99·842	0·943			
54·0		0·59	A	48·4		48·3	48·35		13·65	100·333	99·688	1·016	·01024	·00997	·02021
			A							100·464	99·568	1·032			
54·0		1·3	B	47·6		48·0	47·8		14·2	100·278	99·706	0·984	·00959	·01037	·01996
			B							100·106	99·843	0·949			
			B							100·272	99·672	0·944			

Ledger of Results in Comparison of Bars.

S

Day and Hour, 1839.	True measure at Standard temperature.
h m	
April 8, 2	·02295
„ 9, 7·40	·02248
„ 8, 20	·02278
„ 9, 21	·02310
Mean..	·02283
„ 25, 0· 6	·02107
1·30	·02089
2·20	·02087
2·47	·02143
„ 26, 0· 0	·02095
0·35	·02090
1·42	·02000
2·36	·02013
23·30	·02034
„ 27, 0·20	·02037
1· 0	·02086
1·45	·02071
Mean..	·02071

A

Day and Hour, 1839.	True measure at Standard temperature.
April 8, 20	·02216
„ 9, 21	·02283
Mean..	·02250
„ 24, 23·50	·02019
„ 25, 1·15	·01994
2· 4	·02074
3· 0	·02023
23·45	·01958
„ 26, 0·7	·02055
Mean..	·02021
„ 29, 0·20	·01989

A—*continued.*

Day and Hour, 1839.	True measure at Standard temperature.
h m	
April 29, 0·41	·02019
0·59	·02021
Mean..	·02009

B

Day and Hour, 1839.	True measure at Standard temperature.
April 8, 2	·02180
„ 9, 7·30	·02206
Mean..	·02193
„ 26, 1·22	·01963
2·30	·01986
23·15	·01959
„ 27, 0·10	·01982
0·55	·01942
1·29	·01946
Mean..	·01963
„ 29, 0·30	·01968
0·50	·01980
1· 3	·01996
Mean..	·01981

Ast.

Day and Hour, 1839.	True measure at Standard temperature.
April 24, 23·20	·02386
23·33	·02291
„ 25, 0·29	·02383
1·45	·02347
2·35	·02362
3·28	·02360
23·35	·02375
„ 26, 1· 0	·02303
2·10	·02317
2·55	·02286
23· 5	·02345
23·59	·02252

Ast.—*continued.*

Day and Hour, 1839.	True measure at Standard temperature.
h m	
April 27, 0·35	·02349
1·12	·02342
1·59	·02313
Mean..	·02334

O_2

Day and Hour, 1839.	True measure at Standard temperature.
April 25, 0· 0	·02160
1·25	·02210
2·10	·02241
3· 5	·02197
23·53	·02210
„ 26, 0·15	·02175
Mean..	·02199
„ 28, 23·15	·02108
23·26	·02138
23·40	·02187
Mean..	·02144

O_1

Day and Hour, 1839.	True measure at Standard temperature.
April 26, 1·51	·02135
2·45	·02199
23·47	·02164
„ 27, 0·25	·02115
1· 6	·02131
1·53	·02153
Mean..	·02150
„ 28, 23·20	·02142
23·34	·02153
23·48	·02166
Mean..	·02154

Abstract of Ledger.

1839.	S.	B.	A.	Ast.	O_2	O_1
April 8 and 9........	·02283	·02193	·02250			
April 25, 26, 27.....	·02071	·01963	·02021	·02334	·02199	·02150
April 28 and 29......		·01981	·02009		·02144	·02154
Correction of April 8 and 9......	−·00212	−·00230	−·00229			
Correction of April 28 and 29....		−·00018	+·00012		+·00055	−·00004

Adopted Corrections.

April 8 and 9 = − ·00221
April 28 and 29 = + ·00011.

Corrected Numbers.

	S		B		A	Ast.
4....	·02062	2....	·01972	2....	·02029	
12....	·02071	6....	·01963	6....	·02021	
Mean	·02069	3....	·01992	3....	·02020	·02334
		Mean	·01973	Mean	·02022	

	O_2		O_1
6....	·02199	6....	·02150
3....	·02155	3....	·02165
Mean	·02184	Mean	·02155

Therefore,

			in.	
S	=	Ast.	− ·00265	(Simms's Standard)
B	=	Ast.	− ·00361	(Cape Bar B)
A	=	Ast.	− ·00312	(Cape Bar A)
O_2	=	Ast.	− ·00150	(Ordnance Bar [2])
O_1	=	Ast.	− ·00179	(Ordnance Bar [1])

(Signed) G. B. Airy.

1840, August 13.

OPERATIONS

FOR

THE VERIFICATION AND EXTENSION

OF

THE ABBÉ DE LA CAILLE'S ARC OF THE MERIDIAN,

AT

THE CAPE OF GOOD HOPE.

PART IV.

TRIANGULATION OF THE ARC.

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§ 1. CHARACTER OF THE COUNTRY.

Commencing at Cape Hanglip, and running nearly due north, a sand-stone topped range of mountains, of different elevations under 5700 feet, extends to the north end of the Cedar Mountains (a distance of about 140 miles), where high table land begins, and is continued to the east end of the Kamies Bergen,—the mountains which marked the former north-west boundary of the colony. § 1. Character of the Country.

On the west side of False Bay, a range commences at Cape Point, extends from thence to Table Mountain, a distance of 28 miles: then an interruption of some thirty miles occurs, wherein lie the Cape Downs and a few hills. The next 150 miles northward is partly occupied by the isolated masses, Paarden Berg, Riebeek's Kasteel, Piket Berg, (the Zwartland Plain) and Heerenlogement's Berg. From Heerenlogement's Berg to the Kamies Bergen the surface is mostly an undulating desert, more or less covered with bush and granite boulders. The head lands that here and there fringe the sea shore between Blaauwberg (near the Cape Downs) and the Kamies Bergen are comparatively low, excepting in the neighbourhood of Saldanha Bay.

§ 1. Character of the Country.

Granite and gneiss, topped with sand-stone, is the distinguishing feature of the several masses south of the Kamies Bergen. A few hills are entirely of granite, as Kapoc Berg and the elevations about Groenekloof.

The Kamies Bergen commence at the north-west edge of the Bokkeveld table land, run westward, then north-westward, bordering the sea shore, and enclosing the Kopper Bergen in their course. The most productive of the latter are at the commencement of the bend, near an elevation named Vogel Klip. Strictly the name "Kamies" is confined to about 30 miles of the transverse run: the broad girdle of isolated masses composing the continuation, bear local names mostly of Hottentot origin.

The Kamies Bergen and their continuation bound on the south and west sides, the remarkably flat elevated table land, named the "Bushman Flat," the area of which, excluding the undulating portion adjacent to the Karree Berg and Orange River, may be taken at 6000 square miles, and the mean height of its surface above the sea at 3200 feet. It consists almost entirely of granite and gneiss. Parts of its surface are frosted with quartz; but in general there is a sufficient covering of sand to afford a nidus for grass and stunted bush, which spring up luxuriantly after thunder rains.

On viewing, from the Bushman Flat, the quartz table-shaped tops of the mountains fringing its west border, they convey the impression of being the wreck of disintegration, —the hardy remnants of similar table lands.

Scenery.

Excepting the mountain scenery, and the impress of civilization about the few villages and missionary institutions, there is little to please the eye of the traveller between Cape Town and the Orange River. The outlines of the mountains are sufficiently varied to continually interest,—and it is impossible to regard without emotion, the changing hues of the landscape, when the rays of the rising or setting sun glide along their crests. The sandy downs of the open country between Cape Town and Groenekloof, between Piket Berg and Heerenlogement's Berg, are relieved to a certain extent, by the intermediate blotches of pot-clay, more or less arable, and here and there an oasis as Lang Valei. From Heerenlogement's Berg to the Kamies Bergen the open country is dreary.

Cultivation.

Of the pot-clay blotches, Koeberg and Zwartland in particular, produce excellent corn, said to be unrivalled. The vineyards, orchards, and gardens are mainly confined to the immediate proximity of the mountains and ravines, where evaporation is less and water more abundant than in the open country. But the most remarkable instance of fertility occurs in the occasionally overflowed banks of the Olifant's River, at a place named Friedensdal, in the desert north of Heerenlogement's Berg, where the circumstances are similar to the overflowing of the Nile. The wheat planted in the soil thus watered, returns 120-fold.

Rivers.

Of the several rivers between Cape Town and the Bushman Flat, all are either dry or mere lagoons, except three, during the summer season: the exceptions are the Liesbeek, the Berg, and the Olifant's Rivers. The first, compared with the other two,

§ 1. Character of the Country.

Rivers.

is small: it springs from the south face of Table Mountain and empties into Table Bay, north-west of the Observatory. The Berg River springs from the mountains between Hottentot's Holland and French Hoek, passes northward through Drakenstein and near the Paarl: receives the collection of the "24 Rivers," intersects Zwartland in its westward course, and enters the sea near the south end of St. Helena Bay. Before entering Zwartland, it has received the west face drainage of above 70 miles of mountain range, and by comparison with the mean height of the Base-line, the fall between Piket Berg and its mouth (a distance of some 35 miles) may be estimated at 140 feet, or less than 4 feet per mile: hence the body of water is large at all seasons, and its depth in parts considerable.

Proceeding from the mountains near Winterberg, the Olifant's River takes a northerly course, in the vale on the west side of the Cedar Bergen, receives the Doorn River and other tributaries, bends westward near Freidensdal, and after a few windings opens into the sea, in about latitude 31° 40′. (The latitude was not observed). Between Freidensdal and the sea the fall is small, and the depth in parts from 15 to 20 or more feet. Like most of the South African rivers, the mouth is blocked by a sand bar, underneath the surface of which the water finds its way through the sand into the sea, except during floods, when an open channel is cut by the force of the torrent. There is no bridge over this river, nor over the Berg River below the Paarl; but there is a floating "pont" over the latter, near the entrance to Zwartland.

2. *Description of the Theodolites, and method of using them.*

20-inch Theodolite.

The Fuller Theodolite.—The instrument by means of which the chief portion of the angles were measured, was lent to the Lords Commissioners of the Admiralty, by the Royal Astronomical Society, for service at the Cape,—apparently the first it had been employed in (*a*).

In general construction it is on the plan adopted by Ramsden, for his large Theodolites. The horizontal circle is about 20 inches in diameter, and the telescope about 30 inches in focal length. A second telescope, of shorter length but nearly of equal power, was fixed, at my suggestion, to the frame underneath the divided circle, in the vertical axis prolonged, having a small range of motion in Azimuth for the purpose of adjusting it to a mark. The spirit level of the horizontal axis hangs from projecting cocks fixed to the axis,—and attached to one end of the latter there is a small circle (provided with a short spirit level) intended for measuring differences of elevation to the accuracy of one minute.

Three equidistant microscopes are fixed to horizontal arms projecting from a ring

(*a*). It is named the *Fuller Theodolite* in the observing books, in consequence of having been presented to the Society by the late J. Fuller, Esq., M.P. It was made by Mr. Thos. Jones.

§ 1. 20-inch Theodolite.

which works on the vertical axis,—the outer ends of the arms resting upon a flat ring, along which they are moveable by sliding, and to which one of them is clamped when measuring: this ring serves the purpose of a "repeating table," admitting of an angle being measured on any arc of the divided circle.

The register head of each micrometer screw is divided into 120 parts, marked in succession from 0 to 60, 0 to 60; the divisions of the circle are to every tenth minute, and 5 revolutions of the screw carry the cross wire over one interval, therefore one part of the micrometer equals one second,—the error for "runs" being taken into account. By this arrangement of the micrometer divisions, mistakes of a minute are likely to occur if the excentricity and division errors are considerable.

The quality of the divisions, and the infirm connexion between the biting pieces and block of the tangent screw clamp, were not such as might have been expected from an instrument of its appearance. Against the infirmity of the latter, no other remedy than extreme care was available at the Cape. The division errors were eliminated by measuring each angle on consecutive arcs of the circle without omitting a division, a system not rigorously pursued when triangulating the sections of the Base, but strictly adhered to on the general triangulation.

Method of using the 20-inch Theodolite.

The method pursued in measuring an angle was as follows: the "runs" of the micrometer screws were determined in the accidental temperature, in three equidistant positions of the circle (0°, 120°, 240°, in succession under microscope A) to supply the proportional correction to be applied to each partial measure.

The microscope arm having been clamped to the flat ring, and the lower or "tell tale" telescope pointed to a defined object; the upper telescope was directed to the left hand signal, and the three microscopes were read: the telescope was then directed to the right hand signal, and the microscopes read, *after* examining the "tell tale" telescope bisection. The upper telescope was again pointed to the left, and to the right hand signal as before, and the mean of the two measures was regarded as one *partial measure*, or in field phrase, a "couplet."

Next, the microscope arm was unclamped from the flat ring and slided along it, until the advanced reading of the last measure appeared as near in the focus of microscope A as could be managed with facility: the arm was then clamped, and another "couplet" measured as before; and so on stepping the circle without omitting a division, until as many "couplets" were measured for the determination of the angle (seldom less than thirty for a primary angle, and sometimes as many as eighty) as were believed to be necessary.

If any discrepancy appeared between the first and second measures of a "couplet," the measure was repeated: and generally the telescope was moved from the left to the right hand signal, alternately direct in the order of increasing readings, and back through the supplement of the angle; also one half of the measures were taken with the perforated pivot to the right hand, the telescope was then lifted from its bearings and reversed,

and the other half were taken with the perforated pivot to the left hand. Thus the advantages of the repeating circle were obtained, free from some of its disadvantages, though at a great sacrifice of labour, time, and expense. § 1. Method of using the 20-inch Theodolite.

Care was taken to keep the flat ring clean, to prevent stickage between it and the microscope arms, so as to allow the latter to quickly assume the resting position: and here it may be proper to observe, that greater confidence with respect to the constancy of the relative positions of the microscopes would have been obtained, if the microscope pillars had sprung from a circle attached to the arms, or if the ends of the arms had been joined by arcs of a circle.

Upon the whole, however, there is reason to expect that the angles measured with this instrument by the method just described, are perfectly free from division errors; and that the errors from want of firmness in the clamping, and from any cause which has not a constant tendency in one direction, are so distributed by the large number of repetitions, as to be nearly insensible in the mean also.

The supporting trestle was massive and well braced.

The Beaufort Theodolite.—From an early period of the triangulation, the economical advantage of working two theodolites simultaneously at adjacent stations became obvious, particularly where heliostat signals are used; because the reflector can be placed exactly in line, at the distance of a few feet from a station, by means of the theodolite centered over the station point. The Beaufort $8\frac{1}{2}$-inch repeating Theodolite.

Having solicited Sir Francis Beaufort's attention to this circumstance, he searched, but without success, for a second theodolite of the requisite power: then rather than any thing should be wanting that would facilitate the operation; with his characteristic liberality and public spirit, he at once forwarded to the Cape his own pet theodolite by Reichenbach and Ertel, an instrument of comparatively small dimensions, but of considerable power and exquisite workmanship.

The horizontal circle is about $8\frac{1}{2}$ inches in diameter, divided to every tenth minute, and by each of four verniers to 10 seconds; but three seconds may be estimated with facility, owing to the divisions being sharp and fine, and the plane of the verniers coinciding with the plane of the divided circle. Description of the Beaufort Theodolite.

The upper telescope is about $13\frac{1}{2}$ inches in length (a little longer than the lower): the pivots of its axis are of polished steel, and the axis carries at one end a small altitude circle, counterpoised at the other end by an arm provided with a tangent screw for motion in altitude.

The vernier of the vertical circle is screwed to the frame, near one of the Y bearings, hence when the azimuth axis is adjusted for verticality, the zero of the altitude circle is constant, and one level serves for the adjustments in altitude and azimuth. This (the axis) level rides on the pivots (prolonged) of the horizontal axis.

The makers supplied one mounted and one spare tube, the scale of each cut in the

§ 1. Description of the Beaufort Theodolite.

glass. Two others were added in London, with ivory scales. The divisions of the spare tube have not been examined,—the values of the other are as follows:

Munich,	mounted,	M.	1″·9.
London,	mounted,	A.	3 ·3.
,,	,,	B.	8 ·0.

A has always been employed at the Cape.

Three discs of brass, each having a conical hole to receive the conical end of a foot screw; and three strong pins projecting from its lower surface, for the purpose of being pressed firmly into the wooden top of the supporting trestle,—secure the frame of the instrument against horizontal shift on its bearings.

Method of working the Beaufort Theodolite.

After a few preliminary essays the instrument came into systematic use in March, 1844. With few exceptions, the plan pursued when measuring was by repetition, the verniers being read at the beginning and end of every tenth. The lower or "tell tale" telescope having been adjusted to one of the signals, or to some well-defined mark, was watched from time to time; and if any shift became visible, it was rectified by moving the whole instrument (save the tripod) by means of the proper tangent screw, which transferred the quantity shifted to the following bisection of the right hand signal.

The mean of every tenth repetition being regarded as one partial result, the required number of such results depended upon the importance of the angle, and the atmospheric circumstances during the time when measuring. The value of the latter may be gathered from the fact of five results obtained during first-rate definition, giving a probable error of 0″·05 and weight 360 (*a*); whereas during bad definition and lateral refraction, 16 results gave a probable error of 0·″3, and weight 11 (*b*).

In moving the object glass, it was passed forward over the angle *direct*, and over the supplement of the angle *backward*, in alternate order, which amounts to measuring the angle and its supplement: and if the difference between the elevation of the signals was considerable, the Y bearings were reversed 180° in Azimuth for one half of the partial measures.

Notwithstanding the excellence of the object glass, its small dimensions, compared with that of the 20-inch instrument, was felt when dealing with distant opake signals during sunshine; forasmuch as the phase of the signal was not always visible: but with respect to heliostat signals, the light through a 4-inch diaphragm aperture, distant 80 miles, appeared as a small star in the telescope and was successfully observed! (*c*).

The compactness and portability of instruments of this description particularly suit them for a mountainous country.

Dollond's repeating circle.

Repeating Instrument, by Dollond.—This instrument is described in the 1st volume of the memoirs of the Royal Astronomical Society, page 55. It was used on the triangulation for measuring zenith distances.

(*a*) Simon's Berg, Nov. 19, 1845. (*b*) Kapoc Berg, Feb. 12, 1846. (*c*) Kamies Sector Berg—Keibiskow.

3. *Signals.*

The solar reflectors or heliostats which were employed on the survey, were constructed in a homely way, on the principles of an altitude and azimuth instrument, the reflector swinging toilet-glass fashion in a frame, which frame moved freely in azimuth. The centre of the reflector is supposed to coincide in all positions with the azimuth axis prolonged, and the degree of accuracy aimed at in centering the azimuth axis over the station point, is the same as in centering a theodolite. § I. Heliostats.

The reflector is a piece of silvered plate-glass, 7 inches square, fixed within a teakwood border, by means of corner pieces of tin plate, care having been taken to select plane and parallel surface glass. Stiff cartridge paper is pasted round the border, leaving a circular disc of reflecting surface, 6 inches in diameter. The frame is formed from a piece of steel bar, 16 inches long, 0·5 inch broad, and 0·2 inch thick. Four inches of each end are turned up at right angles, and the centre of the base is perforated to receive a square-necked screw, 2 inches in length, which passes through a teakwood tail piece and the cylinder of hard wood that forms the azimuth axis. The lower end of the screw receives a nut screw, with a loop (in one piece) for the suspension of a plumb-line. An equilateral wooden tripod, furnished with foot screws for levelling it, has a socket in its centre to receive the cylinder or azimuth axis.

The azimuth axis prolonged should intersect the horizontal axis of the reflector, in the centre of the reflecting disc. Opposite to this intersection, a hole of about 0·1 inch in diameter, is made in the tin plate that protects the back or silvered face of the glass: and at the intersection a little of the amalgam is scraped off, for a purpose that will be mentioned presently.

Each heliostat is provided with a small level, to be placed upon the reflecting surface (when turned up) for the purpose of adjusting the cross axis parrallel to the horizon.

The light is reflected towards the required point by means of a hole in a screen, set up at the distance of from 10 to 15 yards in front of the heliostat. A 2-inch aperture is sufficient in the Cape climate for 30 miles, 3 inches for 40 or 50 miles, 4 inches for 70 or 80 miles, &c.

The method of proceeding is as follows: at the station where the theodolite is being worked, a heliostat is placed on a convenient spot near the instrument, and screens with wide apertures are set up in the lines of the distant stations, for the purpose of directing and telegraphing (*a*).

On the signalman reaching a distant station, if the point has not already been defined, he drills a hole in the rock, fills it with lead, drives a brass pin into the centre of the lead, Adjustment of the Heliostat.

(*a*) The following will show the system of telegraphing:—

Attention to your heliostat, or "flashing up" a light.........	Flashes of 3 seconds duration and 3 seconds shade, in alternate order.
Your light not wanted again to-day	3 minutes light, 3 minutes shade, &c., until answered.
Leave your station	10 minutes light, 10 minutes shade, 10 minutes light, until answered.

§ 1. Adjustment of the Heliostat.

and smooth off the top. Having adjusted his heliostat over the brass pin, he turns up the surface of the reflector and places any convenient object in front, looks along the reflector towards the theodolite station, and notes a point on the object, apparently of the same height, by which he is guided in "flashing" until he is answered by a steady light to enable him to fix his screen. This is effected by placing the reflector vertical, and looking through the small hole in the centre; while his second shifts the screen according to his directions, until the light from the theodolite station appears exactly in the middle of the circular aperture,—in which position the screen is firmly fixed. He then throws on his light, and if the theodolite light disappears his adjustments are correct, otherwise he re-examines them.

A slight tap on the tail-piece and reflector bed, at intervals of about 40 seconds, keeps the screen aperture sensibly in the centre of the elliptic section of the reflected rays cast upon the screen.

If it should be remarked that unnecessary details have been here given regarding steps so simple and obvious; the excuse rests with the many prolonged disappointments on the Cape survey, which altogether amounted to a considerable item of expense, and led to the inducement being held out of a higher rate of pay to *leading* signal men;—personal antecedents in this service having proved deceptive.

Opake Signals.

Beyond distances of 20 miles, opake signals were seldom used. The station points were preserved by stone piles of dry masonry, in the form of truncated cones, 12 feet in diameter at the base, 2 feet at the top, and 14 feet high; the axis coinciding with station point. Great care was taken in building them, that they might be employed instead of heliostats, if signal men should be scarce, or the tenure of the stations difficult. Four of this class, over primary points, were partially referred to.

§ 2. Historic Abstract of the Progress of the Triangulation.

§ 2. Year 1841.

After the heliostat drill in September, 1841, signalmen were despatched to Kapoc Berg and Riebeek's Kasteel, and the Fuller theodolite was stationed at the Observatory to commence the triangulation, by measuring the angle between these stations: but the Riebeek's Kasteel light was seldom seen, notwithstanding incessant "flashing up" for some days; it was therefore deemed expedient to concentrate the whole party in Zwartland, and to commence the operation at the Base, where any cause of failure could be quickly investigated, and the qualifications of the parties become better known.

The angles at the terminal points of the Base were finished on the 4th of December, when the instrument was removed to K. F. Contre Berg, and from thence to Kapoc Berg on the 21st. Riebeek's Kasteel was occupied from the 15th of February to the 3rd of April,

Year 1842.

1842: Drie Fontein on the plain from the 8th to the 11th of April: Zwartberg, in Zwartland, from April 15 to May 2: Klip Fontein (the locality of the north end of La Caille's arc) from May 5 to June 3: and Piket Berg from June 5 to June 21.

From the date of the occupation of Riebeek's Kasteel, the triangulation went on with vigor; the individuals of the party had fallen into their proper niches; the middle of winter was now approaching,—the occasional rain and snow storm interruptions being amply compensated by the intermediate splendid definition of the signals,—when on the 18th of June a letter arrived from the Deputy Quartermaster-General, written by direction of His Excellency the Commander-in-Chief, requesting the detachment of the 25th Regiment to be forwarded to Cape Town without delay, as the Regiment was under orders for India. The removal of this detachment reduced the survey party to Serjeant Hemming, and five men Royal Sappers and Miners. With this force the several heliostats could not be efficiently managed; but being desirous of finishing the triangulation of the northern portion of La Caille's arc, the instrument was removed to Patrys Berg, near St. Helena Bay,—Mr. Smyth engaging to work the heliostats on two distant stations in quick succession. The measurement of the angles at this station was commenced on the 30th of June and finished on the 11th of July (though not according to the independent system previously followed); and the remnant of the late party returned to the Observatory with the instruments. § 2. Year 1842. Working party of the 25th Regt. recalled.

With respect to La Caille's arc, it may be proper to explain in this place (though alluded to before, in Part I) that the northern extremity is close up in a corner formed by a north-westerly bend of Piket Berg, which precludes the possibility of connecting it with a station northward of Patrys Berg. Only one angle of the triangle formed by Klip Fontein, Eland's Berg, and Patrys Berg can be measured,—viz., the angle at Patrys Berg, and the elevations eastward of Piket Berg are completely shut out by the latter. Table Mountain presents a similar obstruction in the direction of Cape Point. Terminal points of La Caille's arc are isolated by mountains.

The re-measurement of La Caille's arc, therefore, must from necessity stand by itself as a verification of his measure so far as it went, and no further. Consequently, the expression "verification and extension of La Caille's arc of the meridian" is not strictly correct; moreover, the new and longer arc between Cape Point and the Bushman Flat, is in the meridian described by the optical axis of the 10-feet transit instrument of the Royal Observatory, some $3\frac{1}{2}$ miles east of the meridian of La Caille's Observatory.

Having obtained permission on the 10th of August, 1841, from the trustees of Dirk Gysbert Kotze, to erect a pillar on the Blaauwberg estate, on a hill south-west of his dwelling house, in the meridian of the transit room of the Royal Observatory, a party was told off for this service shortly after the return from the measurement of the Base. The pillar is a truncated pyramid 14 feet high, constructed of stone and lime masonry, cased with Roman cement. Year 1841. Blaauw Berg meridian pillar.

By observation of the consecutive transits of circumpolar stars in the winter season made with the 10-feet transit instrument, the azimuth of the centre of the pillar is 179°·59′·57″, reckoning from the south round by the west; and by triangulation its distance is 68415 feet, or nearly 13 miles north of the transit instrument.

§ 2. Year 1842, August.

On the 1st of August, 1842, the Fuller theodolite was centered over the Observatory roof station, for the purpose of measuring the angle between Kapoc Berg and Riebeek's Kasteel (postponed the year before for the reason given, page 402), and for comparing both with the Blaauw Berg pillar; on the 17th it was centered on the roof of the Rogge Bay Guard House, over the position occupied by the axis of Bradley's sector in the year 1838; on the 23rd of August it was employed at a base-line on the Parade, Cape Town, to determine the height of Table Mountain; and on the 24th it was removed to the station on King's Battery, situated about half way up the north face of Devil's Berg.

Civilians employed in conjunction with Sappers.

As no soldiers could now be spared from the duties of the garrison, it became necessary to organise and instruct the necessary number of civilians to be added to Serjeant Hemming and the four remaining Sappers.

On the 28th of August the wreck in Table Bay of the *Abercrombie Robinson*, a vessel of 1500 tons, threw several persons out of employment, who having no local ties were ready for a bush life, and gladly accepted service on the survey. While organizing the party, the theodolite was engaged on King's Battery Station (*a*). Zwart Kop, south of Simon's Town, was occupied from the 15th to the 28th of November, and Cape Point from the 28th to the 30th. From Cape Point the instrument was taken to the Naval Yard, Simon's Town, to fix the position of a granite block let into the ground in front of the Naval Storekeeper's dwelling, where altitudes are usually taken by the Naval Officers for rating their chronometers (*b*). On the occasion, a copper bolt was let into a large rock, and referred, by leveling, to the midwater point of the self-registering tide-gauge.

Stations south of the Observatory.

The arrangements were now commenced for continuing the triangulation northward from Piket Berg, which included the transport of Bradley's Sector from the Observatory to Heerenlogement's Berg and the Kamies Bergen. Rear-Admiral the Hon'ble Jocelyn Percy, the Naval Commander-in-Chief, who had hitherto evinced a lively interest in the operation, was pleased to grant the use of H.M. Ketch the *Arrow*, to convey the instruments and stores to Donkin's Bay, with directions to the officers to afford every assistance in their power. Accordingly, Captain Robinson brought the *Arrow* round to Table Bay for the cargo, with which I embarked, and left for Donkin's Bay on the 26th of December. On the same day, the survey party in charge of Serjeant Hemming (including a working party of masons and labourers to be left at the termini of the Base) started for Eland's Berg.

Assistance granted by Admiral Percy.

Stations north of the Observatory.

Year 1843.

After a fruitless attempt at Donkin's Bay, the Sector, &c., were safely landed at the mouth of the Berg River, where wagons were obtained for conveying them to Eland's Berg. Shortly after reaching this station I was joined by Mr. Mann, accompanied by

(*a*). The same station point employed when connecting the positions of Sir John Herschel and La Cailie with the Royal Observatory, see Part I.

(*b*). This would be a good position for a 20 or 30-inch transit instrument.

Dr. Wallich, the Superintendent of the Honourable East India Company's Botanic Garden, at Calcutta, and by Serjeant Hemming with the signal party. § 2. Year 1843.

Eland's Berg was occupied on this occasion from January 9 to February 2, and Lambert's Hoek Berg from February 9 to March 2; in the meantime, Serjeant Hemming was encamped at Heerenlogement's Berg with the sector and stores.

Great Comet of March, 1843.

On leaving Lambert's Hoek for the Cedar Mountains, the most splendid Comet (as yet) of the present century burst forth in all its brilliancy. It is impossible to describe the imposing grandeur of the tail as it shot up above the crests of the mountains, illuminating the heavens by its splendour, as we threaded the ravines descending to the Olifant's River on the evening of March 4:—the head was masked by the mountains. On the 5th, we pushed on to the saddle (Ronde Gat) at the entrance to the Cedar Mountain masses, and attempted that evening to obtain a position through the agency of Dollond's theodolite, but failed. After this we were threading our way for several days in the Langkloof ravine of the Cedar Mountains, and when we reached the culminating top of Sneeuwkop on the 20th, the comet had become too faint for observation with our instrumental means.

Cedar mountains.

The Cedar Mountains terminate the range which extends northward from Cape Hanglip to about the parallel of $31^{\circ}\cdot 50'$, where high table land becomes the distinguishing feature on to the Orange River. Four culminating elevations, named Sneeuw Kop, Sneeuw Berg, Tafel Berg, and Joachim's Neus, are nearly of equal height. From the top of either of these a complete view of the horizon is intercepted by the others. The most commanding, particularly with respect to clear sweep, is Sneeuw Kop: from it there is an uninterrupted view from the west round by the north to nearly south; and through the wide gap between Tafel Berg and Joachim's Neus, Table Mountain, near Cape Town, is visible, distant about 112 miles. To the northward, the Kamies Bergen, distant 140 miles, are distinctly seen.

The vegetation in the ravines is luxuriant. The Cedar trees (juniper species) occupy a zone between three to nearly five thousand feet elevation above the sea. A cross section of one of these trees, indicated (according to Dr. Wallich, who had the section made) that it was 121 years old. The wood is rather brittle, of a light colour, and the aroma so strong as to impregnate the air with its fragrance. Above the Cedar tree zone or girdle the vegetation becomes stunted, and the tops of the elevations are naked sandstone.

The labour attending the occupation of the Cedar Berg station was amply repaid by its bold, interesting scenery, irrespective of its importance to the triangulation. The resources were mainly obtained from the Wupperthal Missionary Institution (situated in the vale, on the north-east side of the mountains) through the friendly influence of the Rev. F. G. Schröder, acting in the absence of the superintendent.

On the 4th of April the instruments were removed from the Sneeuw Kop station, by a circuitous path down the east slope to Ezel's Bank; thence through Wupperthal to Clanwilliam, where the party encamped at the hospitable residence of John Ryneveld, Esq.,

§ 2. Year 1843. March and April.

the Civil Commissioner,—a gentleman to whose kind and energetic assistance, both privately and through the influence of his office, the survey was greatly indebted during the lengthened period of the operations in his extensive district.

Heerenlogement's Berg.

On the 13th April, the party reached Heerenlogement's Berg, an isolated elevation of some celebrity, owing to its position on the path to Namaqualand, but more to a small fountain at its base, the influence of which is recorded on the rocky sides of a shallow cave close by (*a*), by names ranging from Governor Van der Stell, year 1701, La Vaillant, and other less distinguished personages, down to the wagon driver who tried to spell his name, and displayed his ambition to let posterity know it.

The operations contemplated at Heerenlogement's Berg included the erection of the Zenith Sector, on or close to the theodolite point on the summit of the mountain; but sufficient room for so large an instrument, with its tent tripod and guy ropes, was not available there,—moreover, the steep declivities to the north-east and south-west could not be regarded with indifference: therefore the sector was placed on a flat rock, 496 feet to the north-westward of the theodolite, and 74 feet less elevated.

June.

The sector and the theodolite observations occupied the interval between the 17th of April and the 13th of June; but for reasons which will appear hereafter, it became necessary to revisit the station with the theodolite, when returning from the northward.

Sappers recalled: immediate compliance impracticable.

On the 28th of April (while engaged at the Heerenlogement's Berg station) I received a letter from the Deputy Quarter-Master General of the Garrison, requesting me to order Serjeant Hemming and the four men, Royal Sappers and Miners, to Cape Town, with the least possible delay.

Representation to Commander-in-Chief.

Private Powel at the time was 50 miles to the north-east of Heerenlogement's Berg, and Private George 30 miles S.S.W. on heliostat stations: Lance-Corporal Stone and Private Ward were about 100 miles to the southward, engaged erecting the pyramids at the Base-line. Immediate compliance with this unexpected recal would have seriously delayed the operation; and Serjeant Hemming, who had charge of the stores and accounts, could not well, if at all, be replaced by his equal. Accordingly, a strong representation was forwarded, through the Deputy Quarter-Master General, to His Excellency Sir George Napier, the Commander-in-Chief,—and His Excellency, for the reasons assigned, was pleased to "sanction the retention of the soldiers for the present."

It may be well, while on this subject, to remark that the system of going into winter quarters (if this led to the communication, and I know of no other reason) which may be necessary in a different climate, does not apply to the Cape; and with respect to Astronomical and Geodetic work, one observation in the winter is equal to three in the summer season. Impressed with these facts, and with the danger of an organised and instructed survey party being broken up at a critical moment, the future arrangements contemplated the employment of civilians only.

(*a*). There is no water between Uitkom and Heerenlogement's Berg, nor between the latter and the Olifant's River.

On the 3rd of June, Dr. Wallich and Mr. Mann left Heerenlogement's Berg for Cape Town, the latter having been relieved by Mr. Smyth. Dr. Wallich had amused himself by gathering specimens of the plants in our path, thus benefiting science while in search of health. He had lived with us on the Cedar Mountain station,—indeed accompanied us wherever we went, enlivening otherwise dull or anxious moments by his animated intellectual conversation; the necessity for his departure, therefore, was a matter of deep regret. § 2. Year 1843.

Having crossed the Olifant's River with the assistance of the Ebenezer Missionary Institution boats, Mr. Smyth was placed in charge of the Fuller theodolite, and established on the Louis Fontein station on the 25th of June,—while I pushed on with the zenith sector to the Kamies Bergen, the ascent to which I reached on the 1st of July. The theodolite had hitherto been worked by myself, or conjointly with Mr. Mann. Louis Fontein.

The Kamies Berg granite masses stand out prominently in front when advancing northward across the Hardevelt. The highest mass, which is named "Welcome," juts out like the corner of a gigantic fortress,—the curtain running eastward, and screening another range from which it is separated by a vale or amphitheatre named Ezels Kloof. Passing the base of "Welcome" on the west, a circuitous ascending route leads to the Lily Fontein Missionary Institution, situated at the west end of an open plateau surrounded by mountain tops, at an elevation of near 5000 feet above the level of the sea. The Lily Fontein range forms the north wall of the amphitheatre; thence stretching eastward some 20 miles, it becomes confounded with, or lost in the high table land of the Onder Bokkeveld. From its prominent points, a complete view is commanded from the west, round by the north to the south-east; "Welcome" and its curtain cuts off the south and south-west. The Kamies Bergen.

While ascending by the circuitous path before-mentioned, we encountered one of the most severe snow storms within my experience. With the kind permission of the Rev. Mr. Jackson, the Superintendent, we established our head-quarters at the Lily Fontein Institution, while the several mountain tops were examined for a station which would be suitable for the sector, and visible from Louis Fontein. After a tedious scouring survey of ten days' duration along the tops, one was found which answered the conditions pretty well, distant about five miles S.E. by E. from the institution, and in the line of a small saddle in the "Welcome" curtain, through which the Louis Fontein station is visible. The part of this mountain range selected, having no local name, has been designated the "Kamies-Sector Berg." It is a flat-topped mass of naked granite, situated towards the north-east end of the amphitheatre before mentioned. A few loose blocks are sprinkled about the top, besides two groups, one at the south-east corner, the other at the south-west,—the former about 20 feet high, the latter less elevated. Certain particulars relating to these groups are given with the observed angles. Kamies-Sector Berg station.

The zenith distance observations were begun on the 25th of July, and finished on the 13th of August. The determination of the azimuthal error of a meridian mark, estab- July.

§ 2. Year 1843.

lished on a rock of the "Welcome" curtain by means of the 30-inch transit, for the purpose of checking the azimuths brought down by calculation from the Observatory: and a small triangulation to the Missionary Institution, together with preparations for departure, consumed another fortnight.

Snow (rather a novelty to Cape low-landers), attended with sharp frost, covered the ground during a large portion of the time.

Return with Bradley's Sector to the Observatory in October.

On my way back from Kamies-Sector Berg with the zenith sector, I was met at the Olifant's River by Mr. Smyth, for the purpose of arranging future operations. On the 23rd of October I arrived at the Observatory, and on the 25th the sector was erected in the sector-room,—ten months from the date of my departure in H.M. Ketch *Arrow*.

Mr. Smyth's operations.

While employed as I have described, Mr. Smyth had been pretty active. He occupied Louis Fontein from June 25 to July 16; Elands Hoogte from July 26 to August 1; Bokkeveld's Berg from August 14 to September 8; and Klip Rug from September 19 to September 28; and when we met at the Olifants River, his wagon was on its way to the Kamies-Sector Berg.

Serjeant Hemming allowed to remain on the survey.

A look-out was now kept for civilians to supply the place of the Sappers, the dates of whose departure from the survey it may be well to trace at once. On the 5th of December I applied to His Excellency the Commander-in-Chief (Sir George Napier) for permission to retain Serjeant Hemming and Lance-Corporal Stone for a time after the retirement of the privates,—a concession His Excellency was pleased to grant.

Royal Sappers and Miners: dates of their leaving the survey. Year 1844.

On the 27th of December, Private Ward was returned to the Commanding Royal Engineer. On the 21st of February, 1844, Privates James George and Walter Powell were returned. On the 30th of March, 1844, Serjeant Hemming retired; and on the 30th of November, 1844, Lance-Corporal Stone also.

Serjeant Hemming had served the term in the Corps of Royal Sappers and Miners that entitled him to ask for his discharge. About the same time I was informed by the Honourable John Montagu, the Colonial Secretary, that having heard of Mr. Hemming's superior qualifications and excellent conduct, he wished to secure his services to the Colonial Government by a permanent appointment, which would have a rising salary, commencing with £120 per annum. On the 26th of March I addressed the following letter (in reply) to the Deputy Quarter-Master General:—

"Royal Observatory, Cape of Good Hope,
26th March, 1844.

Acknowledgment of the services of Serjeant Hemming.

"Sir,—With reference to your letter of last December, signifying that His Excellency the Commander-in-Chief was pleased to sanction Serjeant Hemming and Corporal Stone, Royal Sappers and Miners, remaining on the survey,—I have the honour to state that I have made arrangements for supplying Serjeant Hemming's place, and that I am ready to return him immediately, or on the 31st instant.

"I cannot part with Serjeant Hemming, without expressing the most sincere regard

and esteem for a man, whose uniform temper and strict morality in every sense of the word, had a most beneficial influence on the survey party,—while his rigid regularity, probity, and industry, enabled me to conduct the operation with comparative facility in the department of accounts and stores.

§ 2. Year 1844.

"As a civilian, I hope I shall not be considered to have done any thing incompatible with the regulations of the military service, in bearing testimony to the excellent conduct of Serjeant Hemming, and in acknowledging, on the part of the survey, how ably he performed his duties.

"I have, &c.,

"THOS. MACLEAR.

"To Colonel CLOETE, K.H., &c., &c.,
Deputy Quarter-Master General."

Thus terminated the connexion between the survey and the Royal Sappers and Miners, to whom generally my acknowledgments are due for uniform respect, and attention in complying with my wishes.

Zenith distance observations at the Royal Observatory, Zwart Kop, and Cape Point.

The zenith distance observations at the Royal Observatory made with the sector, together with a multiplicity of other engagements there, consumed the interval between my return on the 23rd of October, 1843, and the 30th of June, 1844. From the Observatory I removed with the sector to Zwart Kop, south of Simon's Town, where the zenith distance observations were commenced on the 25th of July and terminated on the 3rd of October, having been protracted by unfavourable weather, particularly by the effect of a gale which endangered the integrity of the instrument. From Zwart Kop the sector was removed to Cape Point,—a naked windy locality, where it became imperative to abandon the hitherto canvas tent-covering, surrounded by a bush fence, in favour of a wooden building keyed to the rock. A conical-shaped canvas tent, 30 feet in diameter at the base, and 20 feet high, presents a surface which no ordinary system of rope-stays can control in windy weather, irrespective of the changes of tension in the ropes and canvas, depending upon the diurnal changes of atmospheric moisture; and it may not be out of place to mention, as the result of experience with respect to theodolite protection, that a properly constructed wooden building, composed of moveable pieces, is infinitely superior to any framework covered with canvas.

Year 1844—5.

The zenith distance observations were begun on the 16th of November, 1844, and finished on the 15th of January, 1845. On the 17th the instrument was dismantled, and on the 23rd it was erected in the sector-room of the Royal Observatory.

Assistance derived from the Naval Establishment.

To the assistance derived from the Naval Yard, Simon's Town, by command of the Honourable Jocelyn Percy, the Commander-in-Chief; to the cheerful and friendly co-operation of Captain Charles Eden, Lieut. Wainwright, and the several officers on the station, the successful occupation of Zwart Kop and Cape Point Stations with Bradley's Sector is indebted. The instrument was carried over the rugged declivities by marines; a party of sailors were encamped at Zwart Kop to erect the protecting

§ 2. Year 1845.

fence; the services of Lieutenant Hornby were granted, to whose daring intrepidity may be mainly attributed the rescue of the sector from imminent danger during the gale, in the night of the 21st of August.

Zenith distance observations at the Observatory.

On the 24th of January, 1845, the day following the erection of the sector at the Observatory, the zenith distance observation of the stars observed at Zwart Kop and Cape Point was commenced. Between this date and July 8, Cape Point was visited twice and Zwart Kop once with the Beaufort theodolite, for the purpose of measuring horizontal angles at these stations, and for leveling from each down to the sea (the Zwart Kop leveling was carried to the Simon's Bay tide-gauge). The intermediate time was spent at the Observatory, observing zenith distances and measuring angles with the Beaufort theodolite, excepting three days spent on King's Battery Station with that instrument.

Mr. Mann.

Mr. Mann was engaged from July 19 to September 26, scouring the country between Winter Hoek and the Zonder End Mountains, to ascertain the practicability, or the contrary, of forming large triangles between the former and Cape L'Agulhas. His report being unfavourable, the scheme was given up.

Mr. Smyth, Year 1843-4-5.

While these several services were being performed, Mr. Smyth who, in October, 1843, had been met on his way to the Kamies-Sector Berg, occupied that station with the Fuller theodolite, from October 21 to November 10. Returning southward, he visited Elands Berg from the 1st to the 9th of December, for the purpose of connecting the Cedar Berg with the adjacent stations. He next occupied as follows: Piket Berg from December 26, 1843, to February 22, 1844, having been delayed there by the masking difficulties of the eastward masses; Kapitein's Kloof Station from April 22 to May 25; Winter Hoek's Berg from July 9 to October 10 (a difficult snow-capped mountain in the winter season); Sneeuw Kop, near Hottentot's Holland, from November 22, 1844, to July 21, 1845; from the latter he returned to the Observatory, preparatory to leaving the Cape, to fill the chair of Practical Astronomy in the University of Edinburgh, and the office of Royal Astronomer of Scotland, which had become vacant by the decease of the late Mr. Henderson.

At this period the prospective operations needed for completing the survey, were the side triangulation along the southern shore, from Cape Point to Cape L'Agulhas; and northward the triangulation from Kamies-Sector Berg to a point in the Bushman Flat, including observations there for latitude; the distance between the starting points being about 300 miles. To facilitate the immediate accomplishment of the former, Mr. Smyth agreed to delay his departure for a short time, and took charge of the Observatory.

Side triangulation to Cape L'Agulhas.

On the 24th of July, Mr. Mann started for Sneeuw Kop to bring away the Fuller theodolite and equipments from that mountain, which he accomplished by the 31st; then bending his way eastward, he reached the base of the high Zonder End Mountain (north-east of Caledon), on the 6th of August, and its summit on the 8th, with the instrument and stores, the natural difficulties of the ascent being increased in consequence of the depth of snow on the mountain.

While Mr. Mann proceeded to his station, I moved to Cape L'Agulhas per horse wagon, equipped with the Beaufort theodolite, to work the stations on the headlands along the shore,—between which the comparative goodness of the roads admitted of pretty quick traveling. The following dates give the times spent at each of the stations, the intermediate intervals having been taken up in traveling, climbing, &c.; but it should be stated that few angles were required at each:— § 2. Year 1845. July, August, September.

Cape L'Agulhas, occupied from August 3 to August 5.
Danger Point, „ „ August 12 to August 22.
Mudge Point, „ „ August 27 to August 21.
Babylon's Toren, „ „ September 9 to September 14.

When stationed on Danger Point, a violent gale occurred in the night of the 20th of August. The guy ropes of the theodolite tent broke, and the frame was carried over the precipice, and smashed. The custom on the survey, of dismounting the theodolite in the evening, packing it in its box, and building a wall round the box in the absence of a convenient nook or cave, saved the instrument on this occasion, as it saved the Fuller theodolite at the Devil's Berg Station, on the 28th of September, 1842. Mr. Mann, who was stationed at the summit of the Zonder End Mountain, 5300 feet high, and 45 miles inland from Danger Point, states his inability to describe the violence of the snow storm, and the searching severity of the cold during its continuance that night, although the registered temperature by the thermometer was only 22°. Violent gale of wind.

The comparative despatch and mutual advantage, arising from the nearly simultaneous working of the two theodolites on the same triangles, became evident on this small triangulation; but the difficulties in the way of forming a just estimate of the relative precision of dissimilar instruments, with respect to optical power and construction, are obvious. That two instruments, as near as possible alike, are needed for important and expensive triangulations—as a matter of prudence and economy—is proved by the accident that happened to the large theodolite of the Irish survey, and to the large theodolite of the Indian survey. The cost of a second instrument is soon absorbed in the cost of the obstruction, irrespective of the advantage of being able to employ two instruments when opportunity offers.

Mr. Mann finished his observations at the Zonder End on the 15th of September, and proceeded to Kogel Berg Station on the east side of False Bay; in the mean time I returned to the Observatory to relieve Mr. Smyth, where I remained until the 24th, when, perceiving that he had no immediate prospect of a passage to England (*a*), I left for the Tyger Berg Station with the Beaufort theodolite, to connect the Simon's Town Naval Yard, and other places of local interest, with the triangulation.

Having learned from James Searight, Esq. (a merchant in Cape Town), that he had recently purchased the property of the late Mrs. de Wet, and was making alterations in

(*a*) Mr. Smyth sailed for England in the *City of Poonah*, merchant vessel, on the 22nd of October.

§ 2. Year 1845. November. Site of La Caille's Observatory excavated.

the store that covered the supposed site of La Caille's Observatory, which presented an opportunity for examining if any trace of the Observatory existed; accordingly, on the 1st of November I had the floor excavated, the result of which it may be proper to record.

The soil immediately under the surface consisted of sand, remnants of mortar, and broken bricks. At the depth of $2\frac{1}{2}$ feet, a pavement was encountered, of the kind termed "pitching,"—apparently the ancient pavement of the yard; and a portion of a narrow wall, running parallel to the outer wall (the north-west wall) of the yard; also a square-shaped block of rough masonry of between 2 and 3 feet square, horizontal section; both built of stone, cemented with pot-clay. Nothing else was discovered, excepting a letter in the Dutch language, dated July 24, 1783, addressed to Mrs. de Wet.

The result of this investigation proves the fact that no trace of La Caille's Observatory remains; for it can be proved by the diagrams of the property, that the north-west wall of the store was the boundary of the yard or court on that side, in the year 1752,—and the block just described is not only nearer to the wall than the dimensions of the Observatory would permit, but its structure and area are inconsistent with the account given by La Caille (Mem. de L'Academie, 1751, p. 398).

At the south-east side of the yard, sunk even with the pavement and serving a domestic purpose, I found a dressed block of gneiss, somewhat resembling dark-grey limestone in colour, which may have been the top stone of the pillar "M" of "une espace de marbre de Bengale" (Mem. de L'Academie, 1751, p. 399). Mr. Searight kindly allowed me to remove this block.

Although much has been recorded in the first part of this work, to prove the locality of La Caille's Cape Town Observatory, it may not be superfluous to collect the leading facts in this place.

1. La Caille lodged in the house No. 2, Strand-street, then the property and the residence of M. Bestbier; and the Observatory was placed on the north-west side of the yard or court of that house.

2. From M. Bestbier the property passed to Arend de Waal, and from the latter to Mr. de Wet, who, about the year 1798, erected a store on the north-west side of the yard, which store included the site of the Observatory. The widow of Mr. de Wet occupied the house in the year 1838, when the observations were made there with Bradley's Sector, and continued to occupy it until her death in the year 1845, when it was purchased by James Searight, Esq., the present proprietor.

3. The store extends from the dwelling house along the north-west side of the yard, the whole way to its termination in the Fishmarket. Mr. Searight removed the interior partition walls and an outside gallery above in the year 1845; also a number of cottages at the lower end of the yard, formerly tenanted by fishermen, and on their site he has built stores to contain merchandise.

§ 2. Year 1845.

4. The street extending from the north entrance to Government Gardens, to the opening upon the sea beach east of the Fishmarket, was named Heerenstraat in La Caille's time, subsequently Heerengracht as far as Strand-street, and Justice-street from thence to the beach. The south-east side of Justice-street, in La Caille's time, contained the workshops of the Dutch East India Company, afterwards the stores of the British Royal Navy, until the Naval Station was shifted to Simon's Bay. Upon these buildings La Caille saw the corner of the opposite street projected, when he was stationed on Riebeek's Kasteel (Mem. de L'Academie, 1751, p. 429).

Illness of Mr. Mann.

I had now the misfortune to lose the services of Mr. Mann. He had charge of the Observatory while I was engaged on Simon's Berg, from the 15th to the 25th of November. On the 18th of that month he fell from horseback and sustained an injury of the head, from the effects of which he had so far recovered by the 11th of December as to undertake light duty,—but he soon relapsed and left the Observatory for change of air. On the 17th of March, 1846, his medical attendant reported no improvement, and recommended the trial of a colder climate. On the 29th of March he sailed for England, on sick leave, in the *Agincourt*, merchant ship.

The loss of both assistants within a month of each other, and the rumour of a proposal to place the Magnetical and Meteorological service in charge of the Astronomer, prevented immediate arrangements being made for bringing the survey to a conclusion.

December. Mr. Campion engaged.

On the 19th of December I applied to Rear-Admiral the Honourable Jocelyn Percy, the Commander-in-Chief, for the services of Hubert Campion, Esq. (a young gentleman belonging to the flag-ship, who had passed the examination for mate, and had paid considerable attention to scientific subjects), which were readily granted, and Mr. Campion joined the Observatory.

Year 1846. January.

Between the 9th and 28th of January I was engaged with the Beaufort theodolite on the roof of the Observatory, and on the roof of the store over the supposed site of La Caille's Observatory. In the month of February, Mr. George Montagu joined me in a trip to Kapoc Berg with the Beaufort theodolite, preparatory to engaging that young gentleman for service on the survey. (February.)

The intention to plant the north termination of the arc in the Bushman Flat required serious consideration, for the arrangements must comprehend the utmost possible despatch in the execution of the work, because of the sterile character of that locality, and its distance from resources of every description; and if the health of the director of the survey should fail, a competent person should be ready to supply his place. In the latter particular, the ability and sound judgment of Mr. Mann left nothing further to be desired; but his malady continued without any improvement, and it became necessary to look elsewhere.

March.

On the 10th of March, Rear-Admiral Dacres, the new Commander-in-Chief, acceded to the continuance of Mr. Campion's services, subject to the approval of the Lords

§ 2. Year 1846. March.

Commissioners of the Admiralty. On the 27th of March, Captain (now Colonel) Wilmot, Royal Artillery, joined the staff of His Excellency Sir Peregrine Maitland, on the frontier (a Caffre war having broken out), leaving the superintendence of the Magnetic Observatory in my hands,—and on the 29th, as before mentioned, Mr. Mann sailed for England.

My course was now pretty clear: since November the survey party had been reduced to a few individuals for carrying on casual work, and to form the nucleus of a fresh survey party. On the 6th of April Mr. George Montagu was engaged, and conjointly with Mr. Campion, placed in charge of the Fuller theodolite, for the purpose of obtaining a thorough command of that instrument, and to experiment for its division errors.

April. Mr. George Montagu engaged.

June. Arrival of Mr. Childe.

In the month of June, the Rev. George Frederick Childe, M.A., who had received the appointment of 2nd Assistant to the Astronomer, arrived from England, and was placed in charge of the Astronomical work, while arrangements were begun for collecting and organizing the signal party; also the Magnetical and Meteorological Observatory was officially joined to the Royal Observatory,—Captain Wilmot kindly permitting Serjeant Weir and two gunners to remain, until the arrival of an assistant for that department.

Transfer of the Magnetical and Meteorological Observatory to the Astronomical Department. August. September. Arrival of Mr. Smalley. Departure for the Kamies Berg.

On the 10th of August, Messrs. Campion and Montagu set out for Patrys Berg with the Fuller theodolite and a signal party. On the 8th of September, George Robarts Smalley, M.A., arrived from England as 3rd Assistant to the Astronomer for the Magnetical and Meteorological work, and on the 28th I started with Bradley's sector and the Beaufort theodolite for the Kamies Bergen, which I reached on the 17th of October.

October.

By previous arrangement, Messrs. Campion and Montagu left the Fuller theodolite at the Bokkeveld Station, and joined me at Lily Fontein on the 20th of October, for the purpose of a simultaneous reconnoissance of the Bushman Flat. We started with horses and a guide on the 23rd, and by rapid traveling reached Pella, on the Orange River, on the 28th. Two days were spent on the Pella mountain, endeavouring to discover the most elevated part of this singular flat, by means of the nearly horizontal rays of the rising and setting sun. Returning, we bore away to the westward, in the direction of the Copper Mines, and climbed the most commanding elevations on the west and south-west border, and arrived again at Lily Fontein on the 10th of November.

November.

The result of this examination was not so satisfactory as could be wished; it proved the impracticability of seeing a point in the flat, distant some 60 or 70 miles north of the Kamies-Sector Berg, from stations east and west of the latter.

Messrs. Campion and Montagu left for their station on the 11th, and on the 12th I set out with the Rev. John A. Bailie, Superintendent of the Lily Fontein Missionary Institution, and a guide, hoping to penetrate the flat on the eastward side; but owing to intense heat and want of water we were unable to get beyond a spot named Nourbys, where we bivouacked. From this place the top of Keibiskow (a high mountain, distant 70 miles S.E.) was discovered at sunrise; and on the 18th a signal party set out to

Fail in the attempt to reach Boschluis.

occupy it. On the 19th, I proceeded to Roodewal Bay, to select a station in that neighbourhood, and on my return I occupied the Kamies-Sector Berg station with the Beaufort theodolite. § 2. Year 1846.

On the morning of December 1, the Keibiskow heliostat light, which for some days had been anxiously looked for, made its appearance,—distant nearly 80 miles; the image, as seen in the telescope of the Beaufort theodolite, appeared to be about equal in brilliancy to a star of the 4th or 5th magnitude. Having measured the angle between it and the Bokkeveld's Berg light, I started on the 7th to establish a signal party at Boschluis, in the Bushman Flat, taking the eastward route, and entering at "Koegoed Flats." While traveling on the 11th, under a burning sun and clear sky, the cattle sinking from thirst and heat, we experienced the imagery of the desert in perfection. Stunted bushes, at the distance of a few yards, were magnified into wide-spreading trees in violent agitation; the tantalizing deceptive sheet of blue water kept in advance of us a couple of miles, while the view was shut out in other directions by the impenetrable turmoil of the air. Towards sunset the mirage disappeared as the heat moderated, then our guide acknowledged that he did not know where we were, and that we ought to have been at Boschluis two hours before. We therefore stopped, and giving the cattle the supply of water intended for the station, we waited until moonrise, and then retreated on the trace of our wagon wheels to "Kobus," where we obtained a scanty supply of water by digging in the sand. Leaving the party at this place, I rode some 60 miles on the 13th, in a fruitless search for the place we wanted. On the 14th, I rode back to Koegoed Flats, where I obtained a guide who was more successful. December. Mirage in the Bushman Flat.

I have dwelt on this occurrence, to convey some idea of working the Bushman Flat in the summer season.

The following fortnight was spent in part on Kamies-Sector Berg, measuring angles, and in part at the Lily Fontein encampment, sending off supplies and making up accounts.

On the 1st of January, I set out for the Boschluis station, with the Beaufort theodolite, where I arrived on the 5th, barely in time to rescue the leading signalman (*a*), who was sinking from the effect of intense heat and exposure to the sun. The angle between the Keibiskow and Kamies-Sector Berg station detained me there until the 11th, for the top of Keibiskow could only be seen during the maximum refraction. Shortly after daybreak, the culminating top of the mountain gradually ascended above the horizon; at sunrise, the heliostat light entered the telescope like a diffused, orange-coloured nebula, which gradually contracted to a brilliant point, equal to a star of the 5th magnitude. At 7 o'clock on the morning of the 8th, the top assumed the figure of a cocked hat, the light elongated vertically, then separated into a string of beads, each a perfect round image,—the vertical bisecting spider line representing the string. The cocked hat and string of lights above it were apparently separated from the mountain by Year 1847. January. Effect of mirage on the Keibiskow light.

(*a*). Adam Cairns.

F

§ 2. Year 1847.

a band of the sky. This continued about half an hour, then the definition became indifferent, and towards 8 o'clock the top descended, as usual, below the horizon.

The heat at this station, from the 5th to the 11th, was in general from 100° to 105° towards 2 o'clock, p.m., in the shelter of a wagon, shaded from the direct and reflected rays of the sun,—and in the night as low as 50° near the ground.

The interval between the 17th and 28th was spent in writing, examining accounts, &c., on Kamies-Sector Berg,—the movements of Messrs. Campion and Montagu being known by the heliostat telegraph signals. On the 29th, a signal party was despatched to Vogel Klip, near the copper mines,—and on the 30th, I set out with the Beaufort theodolite and leveling apparatus for Roodewal Bay, where I was joined by Mr. Montagu on the 21st of February, who had left Mr. Campion moving with the Fuller theodolite to Louis Fontein.

February.

Shortly after the commencement of operations at Roodewal, the thunder clouds to the north and east, which were expected to appear at a later date, materially retarded the work, by masking the heliostat lights. On the 5th of March, I left for Kamies-Sector Berg, where I was engaged from the 14th to the 21st, measuring the several angles round from Louis Fontein to Vogel Klip,—and on Ezel's Kop from the 23rd to the 30th.

March.

Proceedings of Messrs. Campion and Montagu.

The simultaneous operations of Messrs. Campion and Montagu, from the date of our journey into the Bushman Flat (in November) were as follows: they occupied the Bokkeveld's Berg station from the 20th to the 30th of November, and Keibiskow from the 15th of December to the 26th of January. Returning by Bokkeveld Berg, they mounted the instrument again there, for the purpose of clearing up a discrepancy between the angles connected with the Klip Rug heliostat, and a pile built over the Klip Rug station-point. Next, they occupied Louis Fontein, from the 2nd of March to the 17th of April; on the 23rd, they joined me at the Doorn River, near the north base of the Kamies Berg.

April.

Removal of the zenith sector and head-quarters to the Bushman Flat.

To accomplish the safe conveyance of the sector through the rocky kloofs of the Kamies Berg, it was preconcerted to unite our resources, and to enter the Bushman Flat together. The usual route by Peter's Kloof had been examined, and abandoned in favour of one more direct to the east, provision being made for carrying the sector on men's shoulders through a rugged defile. This was accomplished on the 24th, and on the 28th we reached Riet Fontein, situated on the south border of the flat.

Riet Fontein is an oasis in the desert, where there is a garden containing grapes, figs, and vegetables in profusion. The owner, Gert Beukes, a half-caste, then some 70 years old, had married a Hottentot girl only a few days before our arrival,—whose bridal ornaments chiefly consisted in face patches of black and red paint. His sons by the partner of his youth, with their wives and children, were shifting for themselves some 30 miles off in the desert.

The limits of Gert's domain were undefined: he patronized a few Bushmen, and as his locality was beyond the boundary of the colony, he enjoyed something more than

old baronial independence. But a few months before our visit, the exigencies of a Caffre war had demanded aid from the ex-boundary squatters, which was effected by declaring the true boundary to be a right line drawn from Koegoed Flats to the mouth of the Orange River. This, in conjunction with the general distrust regarding the true object of our operations as land-measurers and beacon-builders on a large scale, touched Gert on a tender point; and his misery became complete on the production of a Government order to force the assistance from his ample stock,—which, by the offer of an amicable adjustment, he previously refused to furnish. After thinking over the matter for a night he agreed to supply our immediate wants, also to forward wagon loads of water to our station, for a stipulated sum per cask; and amicable relations for the future were smoothed by presenting him with a pig of lead. This apparently trifling affair is recorded, for upon Gert Beukes greatly depended the means for occupying the north station. § 2. Year 1847.

On the 30th, we left Riet Fontein, and reached Koe Berg late on the 1st of May; from thence Mr. Campion returned to Riet Fontein, to convey the Fuller theodolite to Vogel Klip,—Mr. Montagu remaining with me. May.

The operations at Koe Berg, and the search for a commanding swell whereon to plant the north station, consumed several days. On the 14th, the sector was removed to the selected locality, and the men commenced to sink a pit 30 feet in diameter and six feet deep. By some inexplicable misunderstanding, the Kamies-Sector Berg light was not directed to this station until the 22nd. Between this date and the 14th of June, the greater part of the theodolite work was effected. June.

On the 18th of June, the zenith distance observations were commenced. On the 23rd, Mr. Campion arrived with the Fuller theodolite, on his way to Boschluis, from whence he returned on the 1st of July.

It now becomes necessary to mention the illness that deprived me of the pleasure of completing the survey in person. The repeated alternate exposure to the burning summer heat of the Bushman Flat, and the pinching cold of the Kamies Berg, combined with great personal exertion in climbing, and indiscreet indulgence in water after long privation, brought on a rheumatic affection in the latter part of March, from which I was slowly recovering, until I had occasion, now in the middle of winter, to sit up every night in the sector-tent, exposed to a freezing temperature. An aggravated relapse ensued on the 22nd of June. Still I persevered with the sector work until the 28th, when finding I could hold out no longer, the continuation of the operations were deputed to Mr. Montagu, and on the 1st of July, I left the station, accompanied by Mr. Campion.

Mr. Montagu finished the sector work on the 11th, and the observations for azimuth on the 17th; and it appears he left the station the day following. July.

The stations on the Bushman Flat were exceedingly difficult to maintain, owing to the scarcity of water. Estimating distance by bullock wagon traveling, the Boschluis station is 40 miles, and the north station 20 miles, from the requisite supply for a party.

§ 2. Year 1847. July. No rain falls upon the Flat unaccompanied by thunder: then hollows in rocks are filled, and if the fall has been plentiful, the Kamies Berg farmers migrate with their flocks, to reap the advantage of the pasturage that quickly springs up. Such a contingency happened while I was engaged at the Roodewal Station in March.

Returning from the Bushman Flat, Mr. Montagu occupied the Kamies-Sector Berg station until the 6th of September, with the Beaufort theodolite. On his way southward from thence he communicated with Mr. Campion, and passed on to the Cedar Mountain station, to connect Kapitein's Kloof with Heerenlogement's Berg, and Klip Rug with Winter Berg. Mr. Campion occupied Heerenlogement's Berg with the Fuller theodolite from the 8th to the 20th of October; then left for the Observatory, which he reached on the 6th of November. On the 8th, he joined the flag-ship.

The services of this accomplished young officer since then, show the error of the notion entertained by many, that scientific pursuits unfit men for the executive department of the Royal Navy.

Year 1848. Mr. Montagu reached Kapoc Berg on the 3rd of January, where he filled up the round of angles. From Kapoc Berg he moved to the Blaauw Berg azimuth pillar, and from the latter he returned to the Observatory on the 8th of April; on the 10th, he retired from the survey. Shortly after, he received the appointment of 2nd Assistant Surveyor-General,—and at a subsequent date, the appointment of Surveyor-General of British Caffraria.

Lastly, Bradley's Sector was erected again at the Observatory in the month of May. The observation of zenith distances commenced on the 1st of June and terminated on the 2nd of September.

On the 1st of May, 1850, Captain Brown, of H.M. Steamer *Geyser*, kindly undertook the charge of conveying the sector to England.

§ 3. Observed Horizontal Angles.

Preliminary Explanations.

§ 3. Method of recording the theodolite measures.

It was the general practice on the survey, when measuring angles, to call out the reading of each microscope or vernier to an amanuensis, who repeated the numbers aloud while recording them in the field-book; and during the evening or other leisure moments the observer computed and applied the corrections for micrometer runs, and calculated the means.

Field-books and copies thereof.

Twenty-four field-books contain the Fuller theodolite measures, and the Beaufort theodolite work occupies two. These books were afterwards transcribed at the Observatory into five pretty thick folio volumes, where the whole of the arithmetic was repeated, and carefully compared with the field-books. Exclusive of these books, there are others, which contain zenith distance measures for time and relative heights.

Reasons for not printing in detail.

The printing of such a mass of figures would incur an unwarrantable expense, and few persons would take the trouble to consult them; therefore, after due consideration, it has been decided to print the mean results only, first placing in evidence the details of one angle by each instrument, which may be taken as the general type of the whole.

Weights of angles. Beaufort theodolite.

The weight annexed to each angle observed with the Beaufort theodolite is the reciprocal of the square of the probable error (P), derived from the formula:

$$P = \sqrt{\frac{\Sigma.\varepsilon \times 0{\cdot}454936}{n^2 - n}}$$

where $\Sigma.\varepsilon$ is the sum of the squares of the differences from the mean of each partial result,—10 repetitions being taken for the unit; $0{\cdot}454936 = 2\,\rho^2$, derived from the theory of probabilities ($\rho = {\cdot}476936$). The weight annexed to the final determination of an angle is the sum of the weights of the separate determinations.

When an angle has been derived from the sum or difference of other angles, the weight (W) annexed:

$$= \frac{W_{\prime} W_{\prime\prime}}{W_{\prime} + W_{\prime\prime}}$$

Fuller theodolite.

With respect to the Fuller theodolite, the errors depending upon the state of the atmosphere and the eye, are mixed up with instrumental errors of a different order to errors of observation. The precision of the partial measures have therefore been regarded as equal, and the weight annexed to each angle is the sum of the partial means from which it is derived. Thus, unfortunately, there is a want of homogeneity in the method of estimating the weights, exclusive of the element introduced by the inequality between the dimensions and optical power of the two instruments. In the latter particular, perhaps, ample justice is conceded to the Fuller theodolite, by regarding a partial mean or two measures, as equivalent to ten measures with the other.

§ 3. Reduction to the center.

It became necessary, on a few occasions, to infringe the general rule of centering the theodolite over the trigonometric or angle point; but great care was taken to prevent the possibility of doubt regarding the elements for calculating the reduction to the center. In each instance, the angle of direction (γ) commences by pointing the telescope to the angle point (C), from which the object glass moves towards the right hand in the order of increasing readings, to the direction of the consecutive distant stations. Instead of the ordinary notation $O + \gamma$, representing the observed angle, and the angular distance of C, from one of the stations, the notation $\gamma\ \gamma_{\prime}\ \gamma_{\prime\prime}$ &c., has been introduced, and the reduction for each station, in other words the angle at each distant station, subtended between the excentric position of the theodolite and C, has been computed separately, and tabulated in consecutive order. By this arrangement, the correction to any observed angle is obtained by algebraically subtracting the reduction for the *left* hand station, *from* the reduction for the right hand station. γ for the left station is always *less* than $\gamma_{\prime}$ for the right. The calculation of the reduction:

$$\frac{r \text{ sine } \gamma}{\text{D sine } 1''}$$

is given with all necessary detail in a tabular form with the observed angles; where r, the distance between the theodolite and angle point, and D, the distance between the angle point and distant station, are expressed in feet.

§ 3. Kamies-Sector Berg Station.

Angle at Kamies-Sector Berg, West Rock Station; between Keibiskow and Bokkeveld Berg: measured with the Beaufort Theodolite.

1846.	Vol. 23, p. 21.	No. of Repetitions.	Pointer.		Verniers.					Mean.			Angle.	
						A	D	B	C				23°·32′.	
			°	′	′	″	″	″	″	°	′	″	″	″
♂ 1st Dec.	*Measured forward, Y right.*													
h m														
A.M., 9· 0	Middling definition.		0	0	0	0	0	2	8	0	0	2·5		
9·24	Do. } Northerly wind, perhaps 1 point E. of N. Hot temperature: about 85°.	10	235	20	0	13	8	10	27	235	20	14·5	1·20	1·20
9·46	Do.	10	110	40	0	28	24	26	32	470	40	28·0	1·35	1·28
10· 9	Not so good.	10	346	0	0	44	50	48	52	706	0	48·5	2·05	1·53
10·35	Worse.	10	221	20	0	60	50	56	64	941	20	57·5	0·90	1·35
11· 0	Worse.	10	96	40	1	20	12	26	28	1176	41	21·5	2·40	1·58
11·21	Same as last.	10	332	0	1	38	34	42	48	1412	1	40·5	1·90	1·63
P.M., 4·48	Bad definition and bad signaling at Bokkeveld	10	207	20	2	8	8	10	20	1647	22	11·5	3·10	1·84
5·11	Definition improving. } Wind west, next S.W., and lastly south; this afternoon very hot, therm. 90°.	10	82	40	2	22	20	30	32	1882	42	26·0	1·45	1·79
5·32	Fair definition.	10	318	0	2	40	45	45	56	2118	2	46·5	2·05	1·82
5·52	Good do.	10	193	20	3	12	8	8	22	2353	23	12·5	2·60	1·90
6·14	Do. do.	10	68	40	3	40	28	42	40	2588	43	37·5	2·50	1·95
6·33	Very good do.	10	304	0	3	50	58	58	60	2824	3	56·5	1·90	1·95
6·48	Excellent do., points.	10	179	20	4	18	8	16	28	3059	24	17·5	2·10	1·96
	Sum of squares of errors $= 4''\!\cdot\!5708$													
	Probable error of 10 measures $= 0{\cdot}42$													
	" " 130 " $= 0{\cdot}1155$													
	$\text{Weight} = \frac{1}{(\cdot 1155)^2} = 75{\cdot}02$													
	Vol. 23, p. 21.													
♃ 3rd Dec.	*Measured backward, Y left.*													
A.M., 8·46	Definition in the morning not good, towards 11ʰ it became much worse.		179	20	4	20	8	12	30	3059	24	17·5		
9· 7		10	304	0	3	62	58	60	70	2824	4	2·5	1·50	1·50
9·30		10	68	40	3	48	34	46	50	2588	43	44·5	1·80	1·65
9·47		10	193	20	3	26	16	22	40	2353	23	26·0	1·85	1·72
10· 6		10	318	0	2	58	58	62	70	2118	3	2·0	2·40	1·89
10·26		10	82	40	2	58	44	60	60	1882	42	55·5	0·65	1·80
10·46		10	207	20	2	20	12	26	30	1647	22	22·0	3·35	1·93
11· 8		10	332	0	1	58	58	58	62	1412	1	59·5	2·25	1·97
♀ 4th Dec.														
			332	0	1	50	50	50	60	1412	1	52·5		
A.M., 8·10	Flashing to the Keibiskow station, from sunrise until 8ʰ 47ᵐ; signal light first returned at 8 47ᵐ.	10	96	40	1	22	26	18	26	1176	41	23·0	2·95	2·09
8·32		10	221	20	0	58	54	58	62	941	20	58·0	2·50	2·14
8·55		10	346	0	0	40	44	44	48	706	0	44·0	1·40	2·07
9·15		10	110	40	0	22	22	18	28	470	40	22·5	2·15	2·07
9·33		10	235	20	0	6	2	0	16	235	20	6·0	1·65	2·04
9·45		10	359	50	9	46	50	52	54	359	59	50·5	1·55	2·00
	Sum of the squares of the errors $= 6''\!\cdot\!04$													
	Probable error of 10 measures $= 0{\cdot}48$													
	" " 130 " $= 0{\cdot}1327$													
	$\text{Weight} = \frac{1}{(\cdot 1327)^2} = 56{\cdot}77$													
	$1{\cdot}96 \times 75{\cdot}02 = 147{\cdot}039$													
	$2{\cdot}00 \times 56{\cdot}97 = 113{\cdot}940$													
	Weight = 131·99) 260·979 = ° ′ 1·98″													
	Resulting angle from 260 meas. = 23·32·1·98													
	Weight = 131·99													

§ 3. Riebeek's Kasteel Station.

Angle at Riebeek's Kasteel, Trigonometric Station; between Kapoc Berg Signal Rock and east end of Base-line heliostats: measured with the Fuller Theodolite.

1842.	Reference to Observation Book.	Remarks.	Pointer.			Microscopes. A	B	C	Runs. +1″·15	Mean.			Angle. 33°·50′.	
			°	′	′	″	″	″	″	°	′	″	″	
♃ Feb. 17	Vol.4 p.52		322	20	8	− 1·8	42·0	29·0	+ ·97	322	28	24·04	57·91	57·09
			356	10	9	− 2·0	40·0	24·6	1·08	356	19	21·95		
			322	20	8	− 2·0	39·8	26·0	·96	322	28	22·23	56·27	
			356	10	9	− 5·5	37·8	20·0	1·07	356	19	18·50		
			356	10	8	37·2	75·0	51·5	1·02	356	18	55·59	47 06	50·70
			30	0	9	31·0	64·6	29·0	1·12	30	9	42·65		
			356	10	8	37·2	72·2	47·2	1·02	356	18	53·22	46·39	
			30	0	9	29·0	62·5	24·0	1·11	30	9	39·61		
	p.62		356	10	8	56·0	95·5	72·3	1·06	356	19	15·66	55·22	
		Repeated on the 19th	30	0	9	55·6	95·2	58·3	1·18	30	10	10·88		
			356	10	8	56·0	97·8	73·8	1·06	356	19	16·93	54·15	
			30	0	9	55·2	96·3	58·2	1·18	30	10	11·08		
	p.52		30	0	9	12·8	52·0	1·0	1·08	30	9	23·01	60·64	60·33
		Runs.	64	0	0	24·0	45·4	1·4	·05	64	0	23·65		
		A B C	30	0	9	12·0	49·8	3·2	1·08	30	9	22·75	60·02	
		− 0·5 −13·4 − 4·8	64	0	0	23·0	45·0	0·2	·04	64	0	22·77		
		+ 0·0 + 0·0 + 5·4 −41·8 −30·0 −47·5	64	0	0	14·8	41·5	− 2·0	·03	64	0	18·13	50·87	52·08
		+39·2 +33·8 +49·8	97	50	1	12·4	31·0	−16·8	·13	97	51	9·00		
		−23·0 −51·8 − 6·4	64	0	0	15·0	39·2	− 4·2	·03	64	0	16·70	53·30	
		+28·0 +52·6 + 0·0	97	50	0	73·2	92·0	44·4	·13	97	51	10·00		
	p.53	− 0·5 −13·4 + 0·6	97	50	1	17·2	23·4	−25·0	·13	97	51	5·33	57·41	58·56
		− 2·6 + 3·8 + 2·3	131	40	2	19·5	17·0	−29·0	·24	131	42	2·74		
		+ 5·0 + 0·8 − 6·4	97	50	0	76·2	80·4	32·8	·13	97	51	3·26	59·71	
		+ 1·9 − 8·8 − 3·5	131	40	1	79·8	77·0	31·4	·24	131	42	2·97		
		$\frac{10·4}{9}$ = 1″·15 −	131	40	2	23·2	16·0	−34·0	·24	131	42	1·97	60·28	60·93
			165	30	2	85·5	65·4	34·8	·35	165	33	2·25		
			131	40	2	14·0	3·0	−51·5	·24	131	41	48·74	61·58	
			165	30	2	74·5	52·4	23·0	·35	165	32	50·32		
			165	30	3	42·2	14·5	− 1·8	·36	165	33	8·99	65·17	62·95
			199	20	4	36·0	6·2	− 1·2	·49	199	24	14·16		
			165	30	3	43·6	16·0	− 3·2	·36	165	33	8·49	67·53	
			199	20	4	37·0	8·4	1·2	·49	199	24	16·02		
	p.62		165	30	3	38·0	88·2	34·2	·45	165	33	53·92	60·51	
		Repeated on the 19th	199	20	4	44·0	94·0	23·6	·56	199	24	54·43		
		* Bad division.	165	30	3	41·8	92·0	33·0	·45	165	33	56·05	58·58	
			199	20	4	46·0	*94·2	22·0	·56	199	24	54·63		
			199	20	4	50·0	21·5	28·2	·52	199	24	33·75	56·71	57·04
			233	10	5	39·5	19·5	30·5	·63	233	15	30·46		
			199	20	4	50·0	22·4	30·5	·52	199	24	34·82	57·38	
			233	10	5	41·2	20·0	33·5	·63	233	15	32·20		
	p.54		233	10	5	28·0	31·0	42·4	·64	233	15	34·44	59·41	61·17
			267	0	6	25·0	34·5	39·8	·75	267	6	33·85		
			233	10	5	28·0	27·2	41·4	·64	233	15	32·84	62·92	
			267	0	6	28·0	36·0	41·0	·76	267	6	35·76		
			267	0	6	38·4	58·2	67·0	·79	267	6	55·32	55·91	56·59
			300	50	7	24·0	64·5	62·5	·90	300	57	51·23		
			267	0	6	39·0	57·8	65·2	·79	267	6	54·79	57·28	
			300	50	7	26·0	66·0	61·5	+ ·90	300	57	52·07		

§ 3. Riebeek's Kasteel Station.

Angle at Riebeek's Kasteel, Trigonometric Station; between Kapoc Berg Signal Rock and east end of Base-line heliostats: measured with the Fuller Theodolite.

1842.	Reference to Observation Book.	Remarks.	Pointer.			Microscopes. A	B	C	Runs. +1″·15.	Mean.			Angle. 33°·50′.	
			°	′	′	″	″	″	″	°	′	″	″	
♀ Feb. 18 A.M.	Vol.4 p.54		300	50	7	30·0	68·6	63·5	+ ·91	300	57	54·94	62·82	
			334	40	8	43·8	73·2	53·2	1·03	334	48	57·76		62·49
			300	50	7	29·5	69·8	64·2	·91	300	57	55·41	62·15	
			334	40	8	44·5	73·5	51·6	1·03	334	48	57·56		
	p.57		334	40	8	43·8	79·8	52·3	1·03	334	48	59·66	63·36	
			8	30	9	41·0	81·0	63·6	1·15	8	39	63·02		62·65
			334	40	8	44·2	79·0	53·4	1·03	334	48	59·90	61·95	
			8	30	9	40·5	79·8	61·8	1·15	8	39	61·85		
			8	30	9	42·0	88·5	71·2	1·16	8	39	68·39	56·27	
			42	30	0	53·0	86·8	53·8	·13	42	31	4·66		57·05
			8	30	9	43·0	88·0	72·2	1·16	8	39	68·89	57·84	
			42	30	0	55·0	88·8	56·0	·13	42	31	6·73		
			42	30	0	57·0	89·4	41·0	·12	42	31	2·59	56·41	
			76	20	1	55·8	84·0	36·5	·23	76	21	59·00		56·81
			42	30	0	57·6	90·0	41·6	·12	42	31	3·19	57·21	
			76	20	1	56·0	86·0	38·5	·23	76	22	0·40		
			76	20	1	49·2	72·2	24·5	·21	76	21	48·84	56·38	
			110	10	2	54·2	64·0	16·5	·32	110	12	45·22		56·96
			76	20	1	49·0	72·2	23·2	·21	76	21	48·34	57·55	
			110	10	2	55·0	64·2	17 5	·32	110	12	45·89		
	p.58		110	10	2	55·0	57·0	16·5	·31	110	12	43·14	59·45	
			144	0	3	53·0	55·3	18·2	·42	144	3	42·59		61·13
			110	10	2	53·5	55·5	14·5	·31	110	12	41·48	62·82	
			144	0	3	54·6	58·0	19·0	·43	144	3	44·30		
			144	0	3	57·2	40·6	5·8	·41	144	3	34·94	56·58	
			177	50	4	52·2	31·6	9·2	·52	177	54	31·52		55·17
			144	0	3	57·8	42·0	8·0	·41	144	3	36·34	53 78	
			177	50	4	51·2	30·8	6·8	·52	177	54	30·12		
			177	50	4	50·5	30·0	12·0	·52	177	54	31·35	63·96	
			211	40	5	51·0	29 4	23·6	·64	211	45	35·31		65·22
			177	50	4	48·8	28·8	14·2	·52	177	54	31·12	66·49	
			211	40	5	51·5	32·0	27·4	·64	211	45	37·61		
			211	40	5	68·0	62·0	14·0	·67	211	45	48·67	57·97	
			245	30	6	71·2	39·2	27·2	·77	245	36	46·64		56·54
			211	40	5	57·2	42·2	61·0	·68	211	45	54·15	55·10	
			245	30	6	38·4	49·2	57·8	·78	245	36	49·25		
	p.59		245	30	6	29·4	44·0	48·0	·77	245	36	41·24	58·67	
			279	20	7	20·2	52·1	44·8	·88	279	27	39·91		59·28
			245	30	6	22·5	40·2	46·4	·76	245	36	37·13	59·87	
			279	20	7	15·2	50·2	43·0	·87	279	27	37·00		
			279	20	7	13·0	48·5	34·3	·87	279	27	32·80	65·49	
			313	10	8	15·3	56·1	40·5	·99	313	18	38·29		64·42
			279	20	7	13·0	45·5	33·6	·86	279	27	31·56	63·36	
			313	10	8	14·0	49·8	38·0	·99	313	18	34·92		
			313	10	8	5·2	41·5	36·0	·97	313	18	28·54	56·67	
			347	0	9	5·4	45·0	22·0	1·08	347	9	25·21		57·39
			313	10	8	5·0	42·0	36·0	·97	313	18	28·64	58·11	
			347	0	9	6·0	45·0	26·0	+1·08	347	9	26·75		

H

§ 3. Riebeek's Kasteel Station.

Angle at Riebeek's Kasteel, Trigonometric Station; between Kapoc Berg Signal Rock and east end of Base-line heliostats: measured with the Fuller Theodolite.

1842.	Reference to Observation Book.	Remarks.	Pointer.		Microscopes.				Runs.	Mean.			Angle.	
						A	B	C	$+1''\cdot15$.				33°·50′.	
			°	′	′	″	″	″	″	°	′	″	″	
♀ Feb. 18	Vol.4		347	0	9	12·2	53·0	37·0	+1·10	347	9	35·17	57·82	
	p.59		21	0	0	15·8	51·0	32·0	·06	21	0	32·99		56·13
			347	0	9	13·0	53·6	36·4	1·10	347	9	35·43	54·43	
			21	0	0	13·0	46·4	30·0	·06	21	0	29·86		
	p.60		21	0	0	12·6	60·0	16·0	·06	21	0	29·59	62·05	
			54	50	1	33·2	70·2	− 9·0	·17	54	51	31·64		62·00
			21	0	0	11·0	58·6	17·3	·06	21	0	29·03	61·94	
			54	50	1	31·0	68·8	− 7·4	·17	54	51	30·97		
			54	50	1	35·4	70·3	7·0	·19	54	51	37·76	64·68	
			88	40	2	49·4	74·5	2·5	·31	88	42	42·44		63·84
			54	50	1	35·0	72·0	8·2	·19	54	51	38·59	62·99	
			88	40	2	47·8	74·0	2·0	·31	88	42	41·58		
			88	40	2	47·0	61·4	−17·0	·29	88	42	30·76	60·91	
			122	30	2	105·6	116·8	51·4	·40	122	33	31·67		58·35
			88	40	1	113·2	128·0	48·6	·30	88	42	36·90	55·78	
			122	30	2	104·2	119·6	53·0	·41	122	33	32·68		
			122	30	2	104·5	112·0	55·6	·40	122	33	31·10	58·82	
			156	20	4	45·0	39·0	4·2	·52	156	24	29·92		56·66
			122	30	2	108·5	115·5	61·8	·41	122	33	35·68	54·51	
			156	20	4	43·8	40·4	4·8	·52	156	24	30·19		
	p.61		156	20	4	46·0	34·0	0·5	·51	156	24	27·34	57·28	
			190	10	5	46·2	23·0	2·8	·62	190	15	24·62		57·03
			156	20	4	45·0	30·6	1·6	·51	156	24	26 24	56·78	
			190	10	5	43·0	21·0	3·2	·62	190	15	23·02		
			190	10	4	93·5	67·6	57·0	·60	190	15	13·30	61·42	
			224	0	5	92·0	66·2	63·8	·72	224	6	14·72		62·59
			190	10	4	88·6	64·0	57·0	·59	190	15	10 46	63·76	
			224	0	6	29·0	7·0	4·5	·72	224	6	14·22		
			224	0	6	31·8	15·4	32·2	·74	224	6	27·21	57·91	
			257	50	7	24·0	18·8	30·0	·85	257	57	25·12		56·36
			224	0	6	32·5	18·0	33·0	·74	224	6	28·57	54·81	
			257	50	7	20·0	18·0	29·6	·85	257	57	23·38		
			257	50	7	23·5	22·2	34·0	·86	257	57	27·43	60·27	
			291	40	8	10·0	33·5	36·7	·97	291	48	27·70		60·55
			257	50	7	22·7	24·0	33·4	·86	257	57	27·56	60·81	
			291	40	8	9·0	35·8	37·4	·97	291	48	28·37		
	p.62		291	40	8	10·0	46·2	43·8	·98	291	48	34·31	57·38	
			325	30	9	8·3	44·2	39·3	1·09	325	39	31·69		58·93
			291	40	8	8·2	41·6	39·4	·98	291	48	30·71	60·48	
			325	30	9	7·5	44·8	38·0	1·09	325	39	31·19		
♄ Feb. 19	p.63		225	30	9	34·8	55·2	− 2·2	1·09	225	39	30·36	58·70	
			259	30	0	51·0	50·2	−14·2	·06	259	30	29·06		57·79
			225	30	9	36·2	56·8	− 0·5	1·09	225	39	31·92	56·87	
			259	30	0	51·2	50·0	−15·0	·06	259	30	28·79		
		Excellent definition.	259	30	0	33·0	18·4	35·0	·06	259	30	28·86	60·51	
			293	20	1	16·8	35·8	35·0	·17	293	21	29·37		59·90
			259	30	0	27·0	22·0	34·8	·05	259	30	27·98	59·29	
			293	20	1	13·5	35·2	32·6	+ ·17	293	21	27·27		

§ 3. Riebeek's Kasteel Station.

Angle at Riebeek's Kasteel, Trigonometric Station; between Kapoc Berg Signal Rock and east end of Base-line heliostats: measured with the Fuller Theodolite.

1842.	Reference to Observation Book.	REMARKS.	Pointer.		Microscopes.				Runs.	Mean.			Angle.	
						A	B	C	+1″·15				33°·50′.	
			°	′	′	″	″	″	″	°	′	″	″	
♄ FEB. 19	Vol.4 p.63		293	20	1	9·0	33·5	25·8	+ ·16	293	21	22·93	54·66	
			327	10	1	58·0	89·6	84·4	·26	327	12	17·59		57·83
			293	20	1	9·0	32·0	24·4	·16	293	21	21·96	60·98	
			327	10	2	6·0	33·6	28·4	·27	327	12	22·94		
			327	10	2	0·8	46·0	30·0	·28	327	12	25·88	58·38	
			1	0	3	1·0	47·2	23·4	·39	1	3	24·26		58·86
			327	10	2	2·0	46·0	30·8	·28	327	12	26·55	59·35	
			1	0	3	1·5	50·0	25·0	·40	1	3	25·90		
	p.64		1	0	2	52·8	103·3	77·4	·38	1	3	18·21	58·01	
		Beautiful definition.	34	50	4	5·2	40·8	1·2	·49	34	54	16·22		60·11
			1	0	2	50·8	102·4	76·3	·38	1	3	16·88	62·21	
			34	50	4	7·6	45·0	3·2	·49	34	54	19·09		
			34	50	4	18·0	41·0	−14·3	·49	34	54	15·39	57·81	
			68	40	5	13·8	46·0	−22·0	·60	68	45	13·20		58·60
			34	50	4	12·8	41·2	−15·8	·48	34	54	13·21	59·39	
			68	40	5	13·5	45·6	−23·1	·60	68	45	12·60		
			68	40	5	15·2	43·7	−24·0	·60	68	45	12·23	53·80	
			102	30	6	16·0	32·0	−32·0	·70	102	36	6·03		55·94
			68	40	5	11·6	43·5	−26·2	·59	68	45	10·22	58·08	
			102	30	6	18·8	34·5	−30·5	·70	102	36	8·30		
			102	30	5	66·8	74·6	18·4	·68	102	35	53·95	50·12	
			136	20	6	52·0	58·4	19·5	·77	136	26	44·07		51·78
			102	30	5	64·5	75·2	18·0	·68	102	35	53·25	53·43	
			136	20	6	55·0	62·2	20·5	·78	136	26	46·68		
	p.65		136	20	6	61·0	57·0	5·2	·77	136	26	41·84	51·16	
		Good definition.	170	10	7	55·0	36·4	5·0	·87	170	17	33·00		53·97
		Calm.	136	20	6	59·0	51·8	4·0	·76	136	26	39·03	56·77	
			170	10	7	56·0	39·0	9·8	·87	170	17	35·80		
			170	10	7	61·0	42·0	18·5	·88	170	17	41·38	63·22	
			204	0	8	66·4	42·0	22·4	1·00	204	8	44·60		62·24
			170	10	7	63·0	43·8	23·0	·89	170	17	44·16	61·25	
			204	0	8	65·2	42·3	25·7	1·01	204	8	45·41		
			204	0	8	61·0	33·0	31·2	1·00	204	8	42·73	55·38	
			237	50	9	47·8	31·2	32·0	1·11	237	59	38·11		54·92
			204	0	8	61·0	35·6	34·5	1·00	204	8	44·70	54·48	
			237	50	9	48·0	33·0	33·2	1·11	237	59	39·18		
			237	50	9	47·8	33·0	48·5	1·12	237	59	44·22	60·64	
			271	50	0	44·8	38·8	50·7	·09	271	50	44·86		61·27
			237	50	9	50·0	38·0	51·0	1·12	237	59	47·45	61·91	
			271	50	0	47·6	44·2	56·0	·09	271	50	49·36		
	p.66		271	50	0	41·0	55·2	58·2	·10	271	50	51·57	59·97	
		Good definition.	305	40	1	34·5	66·5	53·0	·21	305	41	51·54		62·19
		Calm.	271	50	0	37·8	51·2	56·5	·09	271	50	48·59	64·40	
			305	40	1	38·0	66·5	53·8	·22	305	41	52·99		
			305	40	1	42·5	76·0	54·5	·23	305	41	57·90	59·74	
			339	30	2	36·4	83·0	52·5	·34	339	32	57·64		60·68
			305	40	1	43·4	76·2	56·1	·23	305	41	58·80	61·62	
			339	30	2	38·0	86·0	56·2	+ ·35	339	32	60·42		

§ 3. Riebeek's Kasteel Station.

Angle at Riebeek's Kasteel, Trigonometric Station; between Kapoc Berg Signal Rock and east end of Base-line heliostats: measured with the Fuller Theodolite.

1842.	Reference to Observation Book.	Remarks.	Pointer.			Microscopes.			Runs.	Mean.			Angle.	
						A	B	C	+1″·15.				33°·50′.	
			°	′	′	″	″	″	″	°	′	″	″	
♄ Feb. 19	Vol.4		339	30	2	38·4	87·2	58·6	+ ·35	339	33	1·75	60·54	
	p.66		13	20	3	40·2	88·8	56·5	·46	13	24	2·29		58·16
			339	30	2	40·0	91·4	61·0	·35	339	33	4·48	55·78	
			13	20	3	37·0	86·2	56·2	·46	13	24	0·26		
		Light north air.												
			13	20	3	36·8	90·0	46·2	·46	13	23	58·13	63·05	
		Runs, February 22.	47	10	4	49·0	97·8	35·0	·58	47	15	1·18		64·69
		A B C	13	20	3	34·5	88·5	44·2	·45	13	23	56·18	66·33	
		−49·0 −53·9 −55·4	47	10	4	49·0	100·0	36·8	·58	47	15	2·51		
		+44·5 +44·4 +55·5												
	p.67	− 7·8 −58·6 −32·0	47	10	4	53·5	100·0	26·8	·58	47	15	0·68	47·12	
		+ 1·7 +60·8 +31·2	81	0	5	48·5	79·8	13·1	·67	81	5	47·80		
		− 1·4 −57·5 −13·3	47	10	4	50·0	98·8	27·1	·58	47	14	59·21	50·73	48·34
		+ 5·9 +59·8 + 8·5	81	0	5	49·2	83·0	15·6	·67	81	5	49·94		
		−4·5−9·5+0·1 A 3/13·9−=4·6	47	10	4	50·5	100·8	28·0	·58	47	14	60·35	47·15	
		−6·1+2·2−0·8 B 3/ 4·7−=1·6	81	0	5	45·2	81·6	13·7	·67	81	5	47·50		
		+4·5+2·3−4·8 C 3/ 2·0−=0·74												
			81	0	5	40·5	69·2	4·0	·65	81	5	38·55	58·04	
		−6·1−5·0−5·5	114	50	6	41·9	62·2	3·4	·76	114	56	36·59		60·48
			81	0	5	39·3	69·8	1·5	·65	81	5	37·52	62·92	
		$\frac{16·6}{9} = -1·84$	114	50	6	44·3	66·2	8·5	+ ·77	114	56	40·44		
									+1·44					
♄ „ 26	p.79	Runs.	114	50	6	57·8	53·5	2·4	·95	114	56	38·85	53·00	
$10^h 30^m$, A.M.		A B C	148	40	7	53·0	41·8	− 2·5	1·08	148	47	31·85		55·18
		− 7·1 −51·5 − 0·4	114	50	6	57·0	55·0	2·0	·96	114	56	38·96	57·36	
		+ 4·7 +40·9 + 1·0	148	40	7	57·2	47·0	1·5	1·09	148	47	36·32		
		−49·0 −28·2 −40·7												
		+44·4 +32·5 +42·2	148	40	7	66·9	43·8	17·0	1·11	148	47	43·68	54·56	
		−13·5 −31·0 − 5·4	182	30	8	58·0	32·5	20·5	1·24	182	38	38·24		56·59
		+18·1 +31·8 + 1·8	148	40	7	67·0	43·9	17·2	1·11	148	47	43·81	58·61	
		− 2·4 −10·6 + 0·6	182	30	8	60·8	37·0	25·7	1·25	182	38	42·42		
		− 4·6 + 4·3 + 1·5	182	30	8	60·5	34·0	38·3	+1·26	182	38	45·53	56·50	
		+ 4·6 + 0·8 − 3·6	216	30	0	− 2·1	−29·0	−22·7	− ·04	216	29	42·03		57·36
		− 2·4 − 5·5 − 1·5	182	30	8	55·0	31 2	39·0	+1·25	182	38	42·98	58·21	
			216	30	0	− 2·0	−32·2	−22·1	− ·04	216	29	41·19		
		$\frac{9·4}{9} = 1·04$												
$3^h 30^m$, P.M.			216	30	0	49·5	29·4	51·0	+ ·10	216	30	43·40	57·94	
		Last = 1·84	250	20	1	43·5	27·8	52·0	·24	250	21	41·34		58·42
			216	30	0	49·0	28·7	50·6	·10	216	30	42·87	58·90	
		Mean − 1·44	250	20	1	45·0	26·9	52·7	+ ·24	250	21	41·77		

54 Couplets = 33°·50′·58″·524.

☾ 20th February.—In general cloudy, with misty horizon,—none of the heliostats now visible at the same time. Cape Town seen twice, Kapoc Berg once, east end of Base for an hour. N.W. wind and dense fog in the afternoon.

♄ 26th February.—Violent wind from E. by S. came on, on Thursday night and continued until 9 o'clock yesterday morning, then died away; but towards 4 o'clock it returned, last night and this morning it may be called a strong gale. Yesterday and last night the canvas and instrument were removed for security, but time being valuable, an attempt to observe was made at 10^h 30^m this morning. *Bad* images, the instrument not free from danger.

1. Cape L'Agulhas Station.

The only distinguishing feature of Cape L'Agulhas—the extreme southern termination of the African Continent—is an oblong limestone hill of trifling elevation, partly covered with bush. Properly speaking, it consists of three hills which appear as one from the southward. The west end, which is the most elevated part, is 455 feet above the level of the sea, and commands the seaward sweep from Gunner's Quoin, round by the south and east to Struys Point. § 3. Cape L'Agulhas Station.

Owing to the limestone at this part being covered with a deep stratum of indurated sand, our usual method of defining a station, by a cylinder of lead inserted in stone carrying a brass stud, could not be effected; therefore an oak picket, $3\frac{1}{2}$ feet in length, was driven home, and a pin inserted to mark the point.

(It may be proper to mention in this place, that on the occasion of an official visit to L'Agulhas in the autumn of 1848, for the purpose of examining the tower of the lighthouse then recently erected, and superintending certain hydrographical operations connected with the establishment of that light; advantage was taken of the opportunity, to determine the position of the burner with respect to the trigonometric point. The horizontal distance was found to be 4372 feet, and the azimuth of the burner from the trigonometric point 358°·59′·15″, reckoning from the south point round by the west, or 1°·0′·45″ east of south.)

The Beaufort theodolite was centered over *the angle point.*

Names of Stations and Signals.		Observed Angles.	No. of Observations.	Weights.
Between		° ′ ″		
Danger Point, heliostat...	and Referring cleft.......	51·58·25·695	50	11·07
Referring cleft..........	and Zondereinde, heliostat.	5· 3·59·454	60	84·08
Referring cleft..........	and Pot Berg, heliostat....	60·46· 4·425	30	10145·
Zondereinde, heliostat....	and Pot Berg, heliostat....	55·42· 3·944	31	7·60
From the above are deduced:				
Between Danger Point...	and Zondereinde.........	57· 2·25·150		9·78
„ Zondereinde	and Pot Berg...........	55·42· 4·880		91·01

The above angles were measured on the 3rd and 5th of August, 1845, by Mr. Maclear.

2. Danger Point Station.

Danger Point is a bold limestone promontory, from the southern extremity of which a tongue of low land projects in a S.S.W. direction, to the distance perhaps of five miles. Dyer's Island is separated from the east edge of this tongue of land by a narrow passage, and on the west side of the promontory there is a stalactite cavern, the entrance to which is close to the beach. Danger Point Station.

§ 3. Danger Point Station-(*continued*).

The exposed position of the promontory, by projecting into the southern ocean, subjects it to the full force of winds and storms. Lind's wind-gauge, on the 20th of August, indicated a pressure of 15 pounds on the square foot, and occasional puffs jerked out the water.

The station is on the highest or southern end of the promontory, at an elevation of about 1100 feet above the sea, and is marked and protected in the usual way.

The Beaufort theodolite was centered over *the angle point.*

NAMES OF STATIONS AND SIGNALS.	BETWEEN	Observed Angles. ° ′ ″	No. of Observations.	Weights.
Cape Point, heliostat.....	and Sneeuw Kop, pile....	41·36·44·41	80	12·60
Mudge Point, pile.......	and Referring niche......	21·29·44·93	41	11·48
Kogel Berg, pile........	and Referring niche......	25·36·31·64	20	
Referring niche.........	and Zwart Berg (Caledon), pile	36·36·50·37	90	12·73
„ „	and Babylon's Toren, pile .	7·46·53·49	30	0·84
„ „	and Zondereinde, heliostat .	59·52· 6·41	85	40·86
Sneeuw Kop, pile.......	and Zondereinde, heliostat .	67·22·36·08	90	18·71
„ „ pile.......	and Referring niche......	7·30·29·48	40	14·20
Zwart Berg (Caledon), pile	and L'Agulhas, heliostat...	100· 4·20·01	80	18·50
„ „ „ pile	and Zondereinde, heliostat .	23·15·14·51	50	7·97
Zondereinde, heliostat....	and L'Agulhas, heliostat...	76·49· 6·23	80	4·34

The Cape Point heliostat was placed close to the base of the pile on the north side, ∴ the reduction to the center of the pile is $+ 5''\cdot11$.

From the above are deduced :

Cape Point...	and Sneeuw Kop........	41·36·49·52	12·60
Mudge Point...........	and Babylon's Toren......	29·16·38·42	0·52
Sneeuw Kop...........	and Zondereinde.........	67·22·36·01	29·24
Zondereinde...........	and L'Agulhas..........	76·49· 5·82	9·90
Zwart Berg (Caledon)....	and Zondereinde.........	23·15·14·29	11·50
„ „ „ ...	and L'Agulhas..........	100· 4·20·11	21·30

The above angles were measured between the 12th and 22nd of August, 1845, by Mr. Maclear.

3. Mudge Point Station.

Mudge Point Station.

Mudge Point headland is similar in character and general outline to Danger Point. A pile had been built on its southern end (which is the highest) for observation from the adjacent stations, which pile was not disturbed when the Beaufort theodolite was taken to it, owing to the weakness of the party, and to the station being secondary.

As the theodolite tent was not available, the instrument was placed under the shelter of the pile.

§ 3. Mudge Point Station—(*continued*).

Calculation of the reduction to the center of the pile.

γ, the angle of direction, is reckoned from the center of the pile towards the right hand, in the order of increasing readings. Two excentric stations were occupied.

STATIONS.	γ	r	Log. r''. sine. γ	Log Distance.	Log Reduction.	Reduction.
	° ′	feet				″
Kogel Berg....	70·52	10·02	6·29062	4·99839	1·29223	+19·60
Sneeuw Kop ...	102·51	10·02	6·30428	5·14889	1·15539	+14·30
Danger Point ..	259· 5	10 02	6·30737	4·99581	1·31156	−20·49
Cape Point.....	218·20	8·00	6·01008	5·30072	0·70936	− 5·12
Sneeuw Kop ...	283· 1	8·00	6·20621	5·14889	1·05732	−11·41

The reduction for the left hand station, algebraically subtracted from the reduction for the right hand station, gives the reduction to the pile's center.

NAMES OF STATIONS AND SIGNALS.	Observed Angle.	Reduction.	Angle reduced to pile.	No. of Observations.	Weight.
BETWEEN	° ′ ″		° ′ ″		
Cape Point, pile, & Sneeuw Kop, pile	64·40·55·69	− 6·29	64·40·49·40	50	190·73
Kogel Berg, pile, & Sneeuw Kop, pile	31·58·24·28	− 5·30	31·58·18·98	30	4·89
Sneeuw Kop, pile, & Referring niche .	40·15·16·44			30	30·16
Referring niche, & Danger Point ..	115·59· 2·70			60	4·60
∴ Sneeuw Kop & Danger Point ..	75·43·46·26	−34·79	75·43·11·47		3·99

The angle between Sneeuw Kop and Danger Point is not required.

The above angles were measured on the 27th, 28th, and 31st of August, 1845, by Mr. Maclear.

4. Babylon's Toren Station.

Babylon's Toren Station.

On emerging eastward from the Houw Hoek pass, the Tower of Babel mountain stands prominent on the right. It is the west end mass of the irregular range which extends eastward to Breda's Dorp. The Bot River runs close to its base on the west towards the sea, and a valley separates it from the Mudge Point range. The station is on the highest part of the mountain.

The Beaufort theodolite was centered over *the angle point.*

NAMES OF STATIONS AND SIGNALS.	Observed Horizontal Angles.	No. of Observations.	Weights.
BETWEEN	° ′ ″		
Zwart Berg (Caledon), pile and Zondereinde, heliostat.	9·10·44·45	10	
„ „ „ and Gunner's Quoin, helios.	93·10·53·23	10	
„ „ „ and Danger Point, pile ...	113· 0·31·46	46	9·21

§ 3. Babylon's Toren Station —(*continued*).

Zondereinde, heliostat....	and Gunner's Quoin, helios.	84· 0·12·51	70	2·00
„ „ „	and Danger Point, pile ...	103·49·49·46	40	168·11
Danger Point, pile......	and Mudge Point, pile....	73·23·41·81	40	5·67
Mudge Point, pile......	and Kogel Berg, pile.....	47·15·11·32	40	19·40
Kogel Berg, pile........	and Sneeuw Kop, pile....	33· 7·55·43	60	19·40
Table Mountain, pile....	and „ „ „	22·18·39·51	40	5·62
King's Battery.........	and „ „ „	20·35·45·65	10	
Sneeuw Kop, pile.......	and Zondereinde, heliostat.	102·23·28·62	60	82·31
„ „ „	and Zwart Berg (Caledon), pile	93·12·41·93	40	7·03

The angles were measured between the 8th and 15th of September, 1845, by Mr. Maclear.

The party was driven twice from the Station by stormy weather, and for several days it was fog-bound.

5. Zondereinde Berg Station.

Zondereinde Berg Station.

The station is on the highest point of the range of mountains, bordering the left bank of the River "Zondereinde," at an elevation of 5330 feet above the level of the sea. The point is defined in the usual way, by a brass pin hammered into a cylinder of lead in a hole jumped in a rock, over which a pile 14 feet high, 14 feet diameter at the base, and 4 feet diameter at the top, was built on the completion of the observations.

The nearest direction of ascent to the station, from the base of the range, is from the farm of H. Roux.

The Fuller theodolite was centered over *the angle point*.

Names of Stations and Signals. Between		Observed Horizontal Angles. ° ′ ″	No. of Observations.	No. of Partial Measures.
Pot Berg, pile..........	and L'Agulhas, heliostat...	52·36·44·72	100	50
L'Agulhas, heliostat......	and Danger Point, heliostat	46· 8·41·88	120	60
Danger Point, heliostat...	and Zwart Berg (Caledon), pile	30·11·49·34	48	24
„ „ „	and Babylon's Toren, helios.	24· 5· 7·00	80	40
„ „ „	and Sneeuw Kop, H.H., pile	55·24·46·57	96	48
Sneeuw Kop, H. H., pile.	and Pot Berg, pile.......	205·49·49·43	40	20
Gunner's Quoin, heliostat.	and Danger Point, heliostat	21· 3·52·99	40	20
Babylon's Toren, pile....	and Sneeuw Kop, H.H., pile	31·19·38·57	40	20

The above angles were measured between August 13 and September 14, 1845, by Mr. Mann.

Occasional interruptions by snow storms: the cold was intense.

6. Sneeuw Kop, near Hottentot's Holland.

§ 3. Sneeuw Kop, near Hottentot's Holland.

The station is upon the dome-shaped top of the most elevated mountain, of the range near Stellenbosch. In the field-books it is designated Sneeuw Kop, H.H., to distinguish it from Sneeuw Kop of the Cedar mountains. There is no entry in the field-book relating to the method of marking the station point; but there is no reason for doubting that it accorded with the general system,—viz.: a brass pin driven into a cylinder of lead let into a stone.

The Fuller theodolite was centered over *the angle point.*

Names of Stations and Signals.	Between	Observed Angles. ° ′ ″	No. of Measures.	No. of Partial Means.
Cape Point, heliostat.....	and Zwart Kop, heliostat..	14· 6·27·039	160	80
" " "	and Table Mountain, pile..	45·55·29·813	160	80
" " "	and King's Battery, heliost.	48·22·41·201	160	80
" " "	and Royal Observatory, hel.	51· 0·26·285	160	80
" " "	and Rogge Bay Station, hel.	51·15·19·193	160	80
" " "	and Tyger Berg, heliostat..	66·25·39·245	80	40
Zwart Kop, heliostat.....	and Table Mountain, pile..	31·48·59·959	16	8
" " "	and King's Battery, heliost.	34·16·12·613	160	80
" " "	and Royal Observatory, hel.	36·54· 1·207	160	80
Noah's Arc, heliostat.....	and Tyger Berg, heliostat..	48·25·57·511	60	30
Naval Yard, heliostat.....	and Kapoc Berg, heliostat.	70· 5·42·286	60	30
Table Mountain, pile....	and Rogge Bay Station, hel.	5·19·50·155	16	8
" " "	and Green Point, light-house	6·59·18·240	8	4
" " "	and Mouille Point, light-house	7·33· 1·600	8	4
" " "	and Kapoc Berg, heliostat.	43· 4·41·466	160	80
King's Battery, heliostat..	and Kapoc Berg, heliostat.	40·37·29·671	160	80
Rogge Bay Station, helios.	and " " "	37·44·52·464	160	80
Royal Observatory, helios.	and " " "	37·59·44·548	160	80
" " "	and Blaauw Berg, heliostat.	20·52·39·389	16	8
Blaauw Berg, heliostat...	and Kapoc Berg, heliostat.	17· 7· 4·608	72	36
Kapoc Berg, heliostat....	and Riebeek's Kasteel, pile.	28·14· 9·960	10	5
" " "	and Winter Berg, heliostat.	46·56·49·491	160	80
Riebeek's Kasteel, pile...	and Winter Berg, heliostat.	18·42·42·930	8	4
Winter Berg, pile.......	and Zondereinde, heliostat.	84· 6·25·048	160	80
Zondereinde, heliostat....	and Danger Point, heliostat	57·12·50·525	160	80
" " "	and Kogel Berg, heliostat..	110· 5·54·200	74	37
Caledon, Zwart Berg, pile.	and " " pile.....	92·19·46·249	40	20
Danger Point, heliostat...	and Cape Point, heliostat..	82·43·45·752	160	80
Mudge Point, pile.......	and Kogel Berg, pile.....	43· 6· 6·465	40	20
Babylon's Toren, pile....	and " " "	63·48·57·055	40	20

§ 3. Sneeuw Kop, near Hottentot's Holland —(*continued*).

Kogel Berg, heliostat .... and Cape Point, heliostat..	29·50·41·237	80	40
,, ,, ,, and Noah's Arc, heliostat..	47·50·21·122	80	40
,, ,, pile........ and Roman Rock, light-ship	49· 9· 7·770	8	4

The above angles were measured between November 2, 1844, and July 21, 1845, by Mr. Smyth.

7. Kogel Berg Station.

Kogel Berg Station.

The station is upon the top of the highest mountain, of the range that bounds False Bay on the east side. The angle point is marked by a hole in a rock filled with lead, and a brass pin in the center.

On account of the form of the mass of rock, and the position of the plug in it which marks the angle point, the theodolite could *not be* centered exactly over the point; therefore the observations made on this mountain *require a reduction to the center;* and the following are the necessary elements:

Distance of theodolite from angle point (brass pin) 6·0 inches.

Reading for the line passing through the theodolite and angle point 0° 0′ 0″.0.

Reading of the theodolite for the Sneeuw Kop pile.............. 7·35·0.

After the observations, a pile was erected over the *point*, 14 feet in height, 14 feet base, and 4 feet in diameter at the top.

Calculation of the reduction to the angle point on Kogel Berg.

$$r = 0{\cdot}5 \text{ foot. } \log. \frac{r}{\text{sine } 1''} = \log. r'' = 5{\cdot}01340.$$

Angle of direction (γ) measured *from* the center towards the *right.*

STATIONS.	γ	Log. r'' sine γ.	Log distance.	Log reduction.	Reduction.
Sneeuw Kop............	° ′ 7·35	4·13387	4·88766	9·24621	″ +0·176
Zondereinde............	63·27	4·96500	5·47550	9·48950	+0·309
Caledon, Zwart Berg.......	70·33	4·98788	5·26630	9·72158	+0·527
Babylon's Toren..........	90·38	5·01337	5·10299	9·91038	+0·814
Mudge Point............	112·31	4·97896	4·99839	9·98057	+0·956
Danger Point...........	116·36	4·96481	5·29703	9·66778	+0·465
Cape Point............	234·55	4·92632	5·10689	9·81943	−0·660
Zwart Kop............	255·48	4·99992	5·11529	9·84463	−0·767
Dockyard, Clock Tower....	260·53	5·00788	5·14375	9·86413	−0·731
Noah's Arc............	261·11	5·00824	5·11948	9·88876	−0·774
Admiralty House.........	261·23	5·00847	5·14512	9·86335	−0·730
Roman Rock, light-ship....	263·14	5·01036	5·11704	9·89332	−0·782
Table Mountain, pile.......	289·31	4·98770	5·22972	9·75798	−0·573
King's Battery..........	292·43	4·97833	5·22281	9·75552	−0·570
Royal Observatory........	296· 1	4·96700	5·21646	9·75054	−0·563
Tyger Berg............	311·39	4·88685	5·21649	9·67036	−0·468

The reduction for the left hand station, algebraically subtracted from the reduction for the right hand station, gives the reduction to the angle point. § 3. Kogel Berg Station–(*continued*).

Horizontal angles observed at Kogel Berg, reduced to the angle point.

FULLER THEODOLITE.

NAMES OF STATIONS AND SIGNALS.		Observed Horizontal Angles.	Redction to center.	Angles reduced to Station point.	No. of Observations.	No. of Partial Means.
BETWEEN		° ′ ″		° ′ ″		
Sneeuw Kop, H.H., pile........	and Zondereinde, pile............	55·51·46·632	+ 0·133	55·51·46·765	20	10
" " "	and Mudge Point, pile..........	104·55·35·468	+ 0·780	104·55·36·248	80	40
" " "	and Babylon's Toren, pile......	83· 3·15·089	+ 0·638	83· 3·15·727	40	20
" " "	and Danger Point, pile.........	109· 0·55·894	+ 0·289	109· 0·56·183	40	20
" " "	and Zwart Berg (Caledon), pile	62 58·23·481	+ 0·351	62·58·23·832	40	20
Mudge Point, pile..............	and Zwart Kop, pile	143·17·24·308	– 1·723	143·17·22·585	80	40
Cape Point, pile	and " " "	20·53·24·264	– 0·107	20·53·24·157	100	50
" " "	and Table Mountain, pile.......	54·36.30·178	+ 0·087	54·36·30·265	102	51
" " "	and King's Battery, heliostat.	57·47·58·202	+ 0·090	57·47·58·292	80	40
Zwart Kop, pile..................	and Tyger Berg, heliostat......	55·50·35·890	+ 0·299	55·50·36·189	100	50
" " "	and Naval Yard Clock Tower.	5· 4·33·500	+ 0·040	5· 4·33·540	6	3
" " "	and Admiralty House, center.	5·34·35·600	+ 0·040	5·34·35·640	3	
" " "	and Martello Tower, center...	5· 6·10·850	+ 0·040	5· 6·10·890	3	
" " "	and Royal Observatory, helios.	40·13·16·677	+ 0·204	40·13·16·881	80	40
Noah's Arc, center.............	and Tyger Berg, pile..........	50·27·43·300	+ 0·310	50·27·43·610	3	
Roman Rock......................	and Table Mountain.......	26·17·29·650	+ 0·210	26·17·29·860	5	3
Table Mountain, pile...........	and Sneeuw Kop, H.H., pile...	78· 3·52·049	+ 0·749	78· 3·52·798	100	50
King's Battery, heliostat	and " " "	74·52·23·128	+ 0·746	74·52·23·874	80	40
Royal Observatory, heliostat	and " " "	71·33·41·976	+ 0·739	71·33·42·715	80	40
Tyger Berg, heliostat..........	and " " "	55·56·23·589	+ 0·644	55·56·24·233	100	50
Cape Hanglip, pile..............	and Zwart Kop, pile.............	70·47·42·775	– 0·600	70·47·42·175	20	10
Mudge Point, pile	and Cape Hanglip, pile..........	72·29·44·480	– 1·560	72·29·42·920	4	2
Table Mountain, pile..........	and Green Point Light-house.	4·33·30·480			4	2
Green Point Light-house......	and Tyger Berg, pile....	17·33·59·910			4	2
Table Mountain, pile...........	and Mouille Point Light-house	5·26·57·840			4	2
Mouille Point Light-house...	and Tyger Berg, pile............	16·40·33·520			4	2
Robben Island Church Tower	and " " "	11·54·36·710			8	4
Captain Owen's, pile...........	and Cape Point, pile.............	0·20·39·380			2	
" " "	and Table Mountain, pile.......	54·57·17·170	+ 0·090	54·17·17· 26		
Zwart Kop, pile...................	and King's Battery, heliostat..	36·54·32·320	+ 0·200	36·54·32· 52	4	2

The angles at this station were measured between the 1st and 28th of October, 1845, by Mr. Mann.

8. Cape Point Station.

The land forming the west horn of False Bay has been likened to a boot. Viewed from the southward, the remarkable and well-known precipice of hard sand-stone, like the vertical section of a pyramid, is the leading feature towards the toe of the boot. On the top of the precipice, elevated 800 feet above the level of the sea, stands a small conical pile of weather beaten stones, said to be the mark of one of Captain Owen's stations (a bottle containing a pistol bullet was found in a crevice near the top of the pile). From this point the ridge slants north-westward to a saddle, which is less elevated by 112 feet (elevation 688). The theodolite and the sector station are on this saddle, exactly parallel to each other,—the latter to the west of the former, and distant from Cape Point Station.

§ 3. Cape Point Station—(*continued*).

Owen's pile 690 feet. The meridian of the Royal Observatory passes close to this locality, and the Observatory might be seen from it if the trees on the eastward slant of Wynberg hill were not in the way.

The angle point is marked by a brass pin inserted in a plug of lead, let into a hole drilled in a rock, and was left covered by a pile of stones, 12 feet in diameter at the base, 2 feet in diameter at the top, and 12 feet high,—built with great care in the form of a truncated cone, in order that the axis of the cone should be a normal to the station point,—the plan, indeed, pursued with the piles generally throughout the survey.

The several operations performed at this station were carried on at convenient times with reference to each other, and to the signal parties on the neighbouring stations. It was first visited on the 28th, 29th, and 30th of November, 1842, with the Fuller theodolite; next with the Zenith sector and the Beaufort theodolite, in December and January 1844—45; again for a few days in each month of March, May, and June, 1845, with the Beaufort theodolite and levelling apparatus.

The Fuller theodolite was centered over *the angle point.*

NAMES OF STATIONS AND SIGNALS. BETWEEN		Observed Horizontal Angles. ° ′ ″	No. of Measures.	No. of Partial Means.
King's Battery, pile....	and Simon's Berg, heliostat.	40· 8· 5·82	90	45
,, ,, ,,	and Hanglip, pile........	97·33·40·73	74	37
,, ,, ,,	and Hanglip, knob.......	97·19·42·13	6	3
King's Block House, niche	and King's Battery.......	0· 4·43·32	24	12

The Beaufort theodolite was centered over *the angle point.*

				Weights.
Table Mountain, pile.....	and Sneeuw Kop, heliostat.	60·26·14·98	44	179·7
King's Battery, heliostat..	and ,, ,, ,,	57· 8· 0·04	120	49·42
Blaauw Berg, heliostat...	and ,, ,, ,,	53·33· 9·38	116	100·52
Tyger Berg, heliostat	and ,, ,, ,,	43· 9·38·88	100	79·49
Sneeuw Kop, heliostat ...	and Kogel Berg, pile.....	17·28·57·46	50	15·89
,, ,, ,,	and Mudge Point, heliostat	42·22·27·79	60	3·96
,, ,, ,,	and Danger Point, heliostat	55·39·34·47	190	65·24
Subtense of 28 feet at Owen's pile		2·19·43·08	3	

The above angles were measured by Mr. Maclear.

9. Zwart Kop Station.

Zwart Kop Station.

Zwart Kop is one of the sand-stone elevations of the range which forms the west side boundary of False Bay, and the third reckoning from Simon's Town. It is separated by Klaver Valei from signal-hill on the north, and by another ravine from Miller's Point on the south side.

This elevation was selected for a sector station, in preference to Miller's Point, because it seems to be nearly in the center of gravity (meridian-wise) of the ridge. § 3. Zwart Kop Station—(*continued*).

The theodolite station is on the most elevated part, which consists of a narrow ledge of sand-stone blocks, topping a precipice towards False Bay. The Cape Point station is masked by Miller's Point,—a matter of little consequence, owing to its contiguity.

As the ledge of rocks did not afford one-fifth part of the breadth needed for the tripod of the sector-tent, besides the danger of being on the brink of a precipice; a spot was selected for the sector, nearly 92 feet less elevated, 404 feet to the west, and 169·86 feet to the south of the theodolite point, determined by a triangle, one side of which (303·396 feet) was carefully measured

There is no commodious or fitting spot on the parallel of the theodolite station,—and though the selected site is partially sheltered on the east and west sides by ridges of rock, and during the sector observations there was a high ring fence of bush round the tent, yet the instrument narrowly escaped destruction during a gale.

As at Cape Point, this station was occupied several times; first with the Fuller theodolite, afterwards with the Beaufort theodolite, zenith sector, and levelling apparatus.

The Fuller theodolite centered over the *angular point*.—November, 1842.

NAMES OF STATIONS AND SIGNALS.	BETWEEN	Observed Horizontal Angles.	No. of Measures.	No. of Partial Means.
		° ′ ″		
King's Battery, pile......	and Blaauw Berg, heliostat.	2·57· 7·44	46	23
,, ,, heliostat...	and Royal Observatory, hel.	4·20·29·91	86	43
,, ,, pile......	and Simon's Berg, pile....	47· 0·29·13	110	55
,, ,, ,,	and Hanglip, white spot...	115·15·45·09	12	6
,, ,, ,,	and North hump of Hanglip	115· 7·18·52	8	4
A hole plugged with lead, in the vertical face of a rock, the southernmost of a mass near the sector-station.	and King's Battery.......	111·58· 0·72	12	6
The same hole.........	and A hole plugged with lead in the upper surface of a large rock to the north of the latter..	26·18·41·67	16	8

The Beaufort theodolite was centered over *the angular point*.—June, 1845.

				Weights.
Table Mountain, pile.....	and Kogel Berg, pile.....	96·31· 2·90	20	
,, ,, ,,	and Sneeuw Kop, H.H., hel.	79·15·11·06	60	19·73
King's Battery, pile......	and Winter Hoek, heliostat.	28·14·13·23	11	
,, ,, heliostat...	and Blaauw Berg, heliostat.	2·57· 9·00	3	
,, ,, ,,	and Sneeuw Kop, H.H., hel.	67·32·22·05	150	15·23

§ 3. Zwart Kop Station—(*continued*).

King's Block House, niche	and Royal Observatory, hel.	4·27· 9·63	6	
,, ,, ,, ,,	and King's Battery, heliostat	0· 6·40·92	30	3·26
Royal Observatory, heliost.	and Kogel Berg, pile.....	87·27·44·55	50	24·09
,, ,, ,,	and Sneeuw Kop, H.H., hel.	63·11·52·28	100	43·91
Blaauw Berg, heliostat...	and ,, ,, ,, ,,	64·35·14·33	90	80·68
Sneeuw Kop, pile.......	and Kogel Berg, pile.....	24·15·53·49	20	
Sector Station (by the north)	and Sneeuw Kop........	179·33·14·90	4	
Sector Station..........	and King's Block House, niche	111·54·11·70	3	

The small triangle, for the purpose of ascertaining the relative positions of the sector and theodolite stations.

AT SECTOR STATION :			
Theodolite Station.......	and South end of Base, pole	88·33·49·60	5
AT SOUTH END OF BASE :			
Sector Station...	and Theodolite Station....	56·17·25·05	5
AT THEODOLITE STATION :			
South end of Base, pole..	and Sector Station.......	35· 8·43·35	5

The angles at this station were measured by Mr. Maclear.

10. Naval Yard, Simon's Town.

Naval Yard, Simon's Town.

As sextant observations for rating chronometers are usually made at the west end of the Naval Yard, a block of granite was bedded in masonry, in the hollow opposite to the residence of the Naval Storekeeper, in December, 1842,—the upper surface nearly even with the ground. The horizontal distance between its center and the clock-tower is 156 feet, and reckoning from the south round by the west, the azimuth of the tower at the stone is 338°·2′·11″.

Two angles were measured at this stone with the Fuller theodolite, for the purpose of fixing its position ; but one of the points was given up afterwards in favour of another more elevated. They were as follows :

		° ′ ″	Measures.	No. of Partial Means.
Between a chimney near Muizen Berg........	and Helder Berg, heliostat.	45·31·13·38	52	26
Between the same chimney	and Sneeuw Kop, heliostat..	48·45·40·32	46	23

11. Rogge Bay Guard House Station, Cape Town.

Rogge Bay Guard House Station, Cape Town.

The station is on the flat roof, which, like the general roofing in Cape Town, is of brick, covered with a thick coat of lime. For the present purpose additional firmness was given to it by posts resting upon the floor underneath. When closing the opening made in it in the year 1838, a copper tube was inserted, to allow of a plummet being suspended over the granite block left to mark the position of Bradley's sector : therefore, the theodolite could be centered exactly over the position of the spindle.

The angles were measured with the *Fuller* theodolite in October, 1841, and August, 1842,—an observer being stationed at each microscope. Since *then* the building has been taken down; but the stone sunk in the ground remains, covered at present with a mound of earth.

§ 3. Rogge Bay Guard House Station—(*continued*).

NAMES OF STATIONS AND SIGNALS. BETWEEN		Observed Horizontal Angles. ° ′ ″	No. of Measures.	No. of Partial Means.
Kapoc Berg Signal-rock, h.	and Blaauw Berg, pillar...	16·54·38·53	152	74
„ „ „ „	and Riebeek's Kasteel, hel.	33·33·34·96	108	54
Blaauw Berg, pillar......	and Simon's Berg, heliostat	67·37·54·63	68	32
„ „ „	and Riebeek's Kasteel, hel.	16·38·56·83	88	44
„ „ „	and Royal Obs., lantern-ball	91·46·52·77	44	21
„ „ „	and Dassen Berg Rock, ? La Caille's..........	0·29·52·26	3	
Kapoc Berg Signal-rock, h.	and Cylindrical Rock, excentric, heliostat...	0· 1· 0·88	23	
Royal Observ., lantern-ball	and King's Battery, pole..	35·31·38·76	60	29

The above angles were measured by Mr. Maclear.

12. La Caille's Observatory Station.

La Caille's Cape Town Observatory Station.

The position on the roof of the store, over the site of the east corner of La Caille's Observatory, was found by stretching a rope from the corner of the street, and describing an arc with the radius 118·8 feet ($111\frac{1}{2}$ French. Mem. de l'Academie, 1751, page 429); then shifting a small theodolite, armed with a magnetic needle for zero along the arc, until the corner bore 43°·30′ from the south (73°—29°·30). Here the Beaufort theodolite was centered, but on the Kapoc Berg and Riebeek's Kasteel heliostat lights appearing, a blacksmith's chimney and a vessel at anchor in the bay were in line with Riebeek's Kasteel; it became necessary, therefore, to shift the theodolite to a position 124 feet from the corner of the street *(a)*. At this position the observations were carried on during the short intervals between the volumes of smoke from the chimneys, and the thundering of the forge hammers,—the smith refusing to enter into any treaty for indulgence; and when the principal angles were measured, the exact position of the theodolite, with reference to the corner of the street and the point where it ought to have been placed, were ascertained by triangulating over the roofs of the buildings; also the data were obtained for reducing the angles observed at the former to the latter.

At the first station:

	° ′ ″
Reading for the Tyger Berg, pile..............	0· 0· 3
„ „ True Point..................	38·28· 0

(a) The north-west wall of the store is contiguous to a blacksmith's forge, along which there are four forge chimneys and two others.

§ 3. La Caille's Cape Town Observatory Station—(*continued*).

At the true point, 118·8 feet from the corner of the street:

Reading for the Tyger Berg, pile..............	0· 0· 3
„ „ Corner of the Street...........	43· 3·58
„ „ Rogge Bay Guard House Station	2·32·30

The plan of the buildings, plate I, is sufficient for general information, and supercedes any necessity for recording in print a number of measurements which were made on the present occasion.

Calculation of the reduction from the first theodolite position, to the position 118·8 feet from the corner of the street.

$$r = 5{\cdot}192 \text{ feet. } \log. r'' = \log. \frac{r}{\text{sine } 1''} = 6{\cdot}02976.$$

γ, the angle of direction is reckoned *from* the true point towards the right, in the order of increasing readings of the instrument.

STATIONS.	γ	Log. r'' sine γ.	Log distance.	Log reduction.	Reduction.
	° ′				″
Sneeuw Kop	1·31	4·45248	5·24368	9·20880	+ 0 16
Kapoc Berg..............	255·10	6·01504	5·26291	0·75213	− 5·65
Blaauw Berg..............	272· 8	6·02946	4·81828	1·21118	−16·26
Riebeek's Kasteel	288·43	6·00616	5·38593	0·62023	− 4·17
Tyger Berg	321·32	5·82359	4·74787	1·07572	−11·91
Simon's Berg..............	339·40	5·57069	5·17154	0·39915	− 2·51
Royal Observatory	3·35	4·82564	4·23462	0·59102	+ 3·90
King's Battery	38·51	5·82722	4·13241	1·69481	+49·52

NAMES OF STATIONS AND SIGNALS.		Angles observed at 124 feet from the corner of the street.	Reduction.	Angles observed at, or reduced to, 118·8 feet from the corner of the street.	No. of Observations.	Weights.
	BETWEEN	° ′ ″		° ′ ″		
Blaauw Berg, pillar...........	and Riebeek's Kasteel, heliost.	16·34·54·19	+ 12·09	16·35· 6·28	60	15·17
„ „ „	and Tyger Berg, pile			49·24· 4·52	60	10·30
„ „ „	and Dassen Berg, rock ?........	0·27·11·75			10	
Tyger Berg, pile...............	and Royal Obser., lantern-ball	42· 2·39·60	+ 15·81	42· 2·55·41	10	
„ „ „	and „ „ „ „			42· 2·55·03	40	1·00
„ „ „	and King's Battery, pile.......			77·20·42·63	20	
Kapoc Berg, heliostat.........	and Blaauw Berg, pillar.........	16·57·36·78	− 10·61	16·57·26·17	60	5·30
„ „ „	and Sneeuw Kop, pile...........	106·21·26·63	+ 5·81	106·21·32·44	52	27·84
„ „ „	and Riebeek's Kasteel, heliost.	33·32·30·39	+ 1·48	33·32·31·87	110	16·69
Riebeek's Kasteel, heliostat.	and Simon's Berg, pile.	50·57·14·88	+ 1·66	50·57·16·54	20	
Royal Observat., lantern-ball	and King's Battery, pole.......	35·17·12·78	+ 45·62	35·17·58·40	20	
„ „ „ „	and „ „ „			35·17·50·30	20	
Dassen Berg, rock.............	and Summit of Dassen Berg...	0· 6·44·			1	
Lion's Rump, signal-staff....	and Kapoc Berg, heliostat......	72·15· 3·60			10	
Tyger Berg, pile...............	and Station House, chimney...	27·55·43·63			4	
Station House, chimney......	and King's Battery, pole.......	49·24·31·50			4	

The angles were measured between the 9th and 28th of January, 1846, by Mr. Maclear.

13. Cape Town Parade, Base-line.

§ 3. Cape Town Parade, Base-line.

With the view of establishing a permanent length, in a convenient position, for testing surveyors chains and other local purposes, two guns (24-pounders) were sunk in the parade ground, and built in with masonry, in November, 1837,—their muzzles even with the surface, and surrounded by a circle of nearly flat brick work. The position of the west gun is between the north end of the Commercial Exchange building and the Custom House; that of the east gun is near the small entrance gate next to the Castle, and the line between them runs parallel to the north enclosing wall, a few yards south of the avenue of trees on that side. The muzzle of each gun is plugged with lead, in the centre of which a brass pin is driven home to define the terminal point.

The line was measured on the 2nd of December, 1837, with trussed deal rods, each 20 feet long, resting on trestles, and found to be 1049·209 feet in the mean temperature 89°·9, during measurement, or reduced to the temperature 70°,—1049·279 feet, from which ·018 foot should be subtracted owing to a slight inclination of the ground.

On the 23rd of August, 1842, the Fuller theodolite was employed at the terminal points, to measure the horizontal angles between the line and a conspicuous tooth-shaped rock on the top of Table Mountain; and two days after, Dollond's repeating instrument was employed to measure the zenith distance of the rock, both as follows:—

AT THE EAST TERMINAL POINT:

Horizontal angle between the rock on Table Mountain and west terminal point 120° 51′ 9″·73, 48 measures or 24 partial means.

Zenith distance of the rock 76° 10′ 54″·4, 40 repetitions.

AT THE WEST TERMINAL POINT:

Horizontal angle between the east terminal point and the rock on Table Mountain, 55° 40′ 13″·57, 52 measures or 26 partial means.

Zenith distance of the rock 76° 42′ 42″·16, 40 repetitions.

The zenith distances are corrected for the height of the trestle (3 feet 11 inches) above the muzzles of the guns.

14. Royal Observatory.

Royal Observatory.

The top of the lantern is the only part of the roof that commands the sweep of the horizon, but it is totally unfitted for supporting a theodolite. The selected trigonometric or angle point, is the centre of the strong iron bolt which passes through the zenith shutter, over the 10-feet transit instrument, with a ring at its lower end to receive the

§ 3. Royal Observatory —(*continued*).

hook of the pulleys for raising the instrument from its bearings. The upper end of the bolt appears outside, and its centre may be regarded, in practice, as coinciding with the zenith of the instrument.

To keep the shutter in firm contact with the cheek pieces of the meridian opening, it was loaded with several pigs of lead, and planks were placed, stage fashion, to isolate three observers (one for each microscope), to avoid any disturbance which might be occasioned by moving round the instrument.

The several obstructions in the direction of distant stations are a dome on each wing of the building, the lantern, and the elevation of the east and west wings above the roof of the transit room. These necessitated the occupation of excentric stations.

August, 1842.—The Fuller theodolite centered over a point on the shutter, $5\frac{1}{2}$ inches due north of the angle bolt.

$$r = 5\tfrac{1}{2} \text{ inches. } \log. \frac{r}{\text{sine } 1''} = 4{\cdot}97530 = \log. r''.$$

(^{1}) γ, the angle of direction, measured *from* the angle point round by the right.

STATIONS.	γ	Log. r''. sine. γ	Log Distance.	Log Reduction.	Reduction.
	° ′ ″				″
Kapoc Berg	172·35·50	4·08535	5·27715	8·80820	+0·064
Blaauw Berg, pillar	180· 0· 0				
Riebeek's Kasteel.......	207· 5·56	4·63381	5·37893	9·25488	—0·180

(^{2}) The Beaufort theodolite placed on the adjacent west parapet.—June, 1845.

$$r = 12{\cdot}74 \text{ feet. } \log. r'' = 6{\cdot}41960.$$

Sneeuw Kop	14·37·53	5·82203	5·19913	0·62290	+ 4·197
Zwart Kop.............	94·31·43	6·41824	5·02695	1·39129	+24·620
Kapoc Berg	263·35·10	6·41687	5·27715	1·13972	—13·795
Blaauw Berg...........	270·59·43	6·41953	4·83516	1·58437	—38·404

(^{3}) On the shutter due south of station bolt.—June, 1845.

$$r = 1{\cdot}467 \text{ feet. } \log. r'' = 5{\cdot}48086.$$

Sneeuw Kop	103·38·50	5·46843	5·19913	0·26930	+ 1·859

§ 3. Royal Observatory —(*continued*)

(4) On west wing sky-light frame.—September, 1846.
$r = 17{\cdot}717$ feet. log. $r'' = 6{\cdot}5628153$.

Sneeuw Kop	16·34· 8	6·01792	5·19913	0·81879	+ 6·589
Kogel Berg............	44· 9· 6	6·40577	5·21646	1·18931	+15·464
Zwart Kop.............	96·27·48	6·56005	5·02695	1·53310	+34·127
Blaauw Berg....... ...	272·56· 4	6·56225	4·83516	1·72709	−53·345

(5) On the north-east chimney of west wing.—July, 1857.
$r = 42{\cdot}627$ feet. log. $r'' = 6{\cdot}9441075$.

Zwart Kop.............	23·14·48	6·5403641	5·0269456	1·5134185	+ 32·615
Blaauw Berg...........	199·43· 1	6·4722187	4 8351480	1·6370707	− 43·358
Tyger Berg............	246·47·17	6·9136391	4·6507367	2·2629024	−183·190
Simon's Berg...........	278·44·38	6·9390305	5·1241745	1·8148560	− 65·291

The reduction for the left hand station, algebraically subtracted from the reduction for the right hand station, gives the reduction to the center,—viz.: to the bolt angle point in the zenith of the transit instrument.

NAMES OF STATIONS AND SIGNALS.		Beaufort or Fuller Theodolite.	Observed Angles at excentric station.	Reduction to angle point.	Horizontal Angles at angle point.	No. of Observations.	Weights and Partial Means.
			° ′ ″	″	° ′ ″		
(1) Kapoc Berg, heliostat....	and Blaauw Berg, pillar........	F	7·24·10·313	− 0·064	7·24·10·25	153	59·00
„ „ „	and Riebeek's Kasteel, heliost.	F	34·30· 7·043	− 0·244	34·30· 6·80	183	90·00
Blaauw Berg. pillar.......	and „ „ „	F	27· 5·56·350	− 0·180	27· 5·56·17	105	51·00
Kapoc Berg, heliostat....	and Cylindrical Rock, exc. hel.	F	0· 0·48·378			16	
(2) Kapoc Berg, heliostat....	and Blaauw Berg, pillar.........	B	7·24·33·494	− 24·609	7·24· 8·88	40	9·34
„ „ „	and Sneeuw Kop, heliostat......	B	111· 2·43·542	+ 17·992	111· 3· 1·53	120	12·64
„ „ cylind. rock	and Signal Rock, heliostat......	B	0· 0·34·120			212	
Blaauw Berg, pillar.......	and Sneeuw Kop, heliostat......	B	103·38· 9·054	+ 42·601	103·38·51·65	70	35·94
Sneeuw Kop, heliostat...	and Zwart Kop, heliostat........	B	79·53·49·570	+ 20·423	79·54· 9·99	110	19·21
(3) Blaauw Berg, pillar.......	and Sneeuw Kop, heliostat.....	B	103·38·49·650	+ 1·860	103·38·51·51	10	
(4) Sneeuw Kop. pile..........	and Kogel Berg, pile..............	B	27·34·59·275	+ 8·875	27·35· 8·15	40	23·81
Zwart Kop, pile............	and Blaauw Berg, pillar.........	B	176·28·16·000	− 87·470	176·26·48·53	10	
Kogel Berg, pile............	and Zwart Kop, pile	B	52·18·42·180	+ 18·660	52·19· 0·84	41	9·33
(5) Blaauw Berg, pillar......	and Tyger Berg, pile.............	B	49· 4·16·580	−139·830	49· 1·56·75	40	13·44
„ „ „	and Simon's Berg, pile...........	B	79· 1·37·470	− 21·930	79· 1·15·54	70	10·20
Simon's Berg, pile.........	and Zwart Kop, heliostat.......	B	104·30· 9·480	+ 97·910	104·31·47·39	149	19·90

By observation with the 10-feet transit instrument, the azimuth of the Blaauw Berg pillar's center is 179°·59′·57″, and from the triangulation its distance appears to be 68415 feet.

15. King's Battery Station.

King's Battery Station.

The theodolite was centered over this angle point in the year 1837, when connecting Sir John Herschel's position at Field Haussen, with the Royal Observatory, and with La Caille's Observatory in Cape Town, (part I, page 121). It is near the center of the

§ 3. King's Battery Station—(*continued*).

platform of the battery, on the east face of Devil's Berg, at an elevation of about 1415 feet above the level of the sea.

The instrument was centered over the angle point.

FULLER THEODOLITE.—SEPTEMBER, OCTOBER, NOVEMBER, 1842.

NAMES OF STATIONS AND SIGNALS.	BETWEEN	Observed Angles. ° ′ ″	No. of Measures.	No. of Partial Means.
Blaauw Berg, pillar......	and Riebeek's Kasteel, hel.	21·59 37·41	77	36
,, ,, ,,	and Simon's Berg, pile. (*a*)	71·11·32·36	112	56
,, ,, ,,	and Zwart Kop, heliostat..	173· 4·48·28	104	51
Kapoc Berg, heliostat....	and Riebeek's Kasteel, hel.	32·58·17·03	172	60
,, ,, ,,	and Blaauw Berg, pillar...	10·58·40·20	248	122
Signal Rock, heliostat....	and Kapoc Bg., cyl. rk. exc. h.	0· 0·50·55	8	
Lion's Rump, signal-staff..	and Royal Obs., lantern-ball	103·38· 9·86	8	4
Rogge Bay Guard House.	and ,, ,, ,,	92·10· 6·05	62	31
Royal Observ., lantern-ball	and Sir J. Herschel's, obelisk	112·39·47·87	10	5
Robben Isld., church-tower	and Royal Obs., lantern-ball	77·13· 4·13	16	
Simon's Berg, pile.......	and Cape Point, heliostat..	98·11·10·17	76	38
,, ,, ,,	and Cape Hanglip, culm. pt.	65·41·38·27	16	8

BEAUFORT THEODOLITE.—JULY, 1845.

				Weights.
Kapoc Berg, heliostat....	and Sneeuw Kop, heliostat.	105·51·55·78	113	29·48
Sneeuw Kop, heliostat ...	and Cape Point, pile	74·29·25·54	120	78·63
,, ,, ,,	and Zwart Kop, pile......	78·11·29·71	220	22 00
Blaauw Berg, pillar......	and Sneeuw Kop, heliostat.	94·53·17·00	50	259·10
,, ,, ,,	and Simon's Berg, pile....	71·11·29·45	30	0·42
,, ,, ,,	and Tyger Berg, pile.....	43·45·41·45	20	2·00
Sneeuw Kop, heliostat....	and Sir J. Herschel's, obelisk	65·30·44·98	10	
,, ,, ,,	and Kogel Berg, pile.....	26·54·14·28	10	24·52
Tyger Berg, pile........	and Sneeuw Kop, pile....	51· 7·35·93	20	2·00
,, ,, ,,	and Muizen Berg, pile....	127·30·33·58	10	0·50
Simon's Berg, pile.......	and Cape Point, pile.....	98·11·13·20	10	0·50
,, ,, ,,	and Zwart Kop, pile......	101·53·16·49	40	12·95
,, ,, ,,	and Muizen Berg, pile....	100· 4·45·95	10	0·50
Kogel Berg, pile........	and Cape Point, pile	47·35· 9·63	40	9·62
,, ,, ,,	and Zwart Kop, pile......	51·17 12·58	40	19·36
Cape Hanglip, pile......	and Cape Point, pile	32·29·21·33	20	2·00
Cape Point, pile........	and Cape Point, sect.-station	0· 1·11·30	5	
,, ,, ,,	and Zwart Kop, pile......	3·42· 1·53	20	2·00
Zwart Kop, pile.........	and Blaauw Berg, pillar...	186·55·14·35	20	2·00

The above angles were measured by Mr. Maclear.

(*a*) Doubtful, owing to the pile at Simon's Berg having fallen within 7 feet of the base. The loose stones were cleared away before measuring the angles with Cape Point and Hanglip.

16. Tyger Berg Station.

The station is on the middle rise, which is the highest part of Tyger Berg. It was occupied for the purpose of fixing the position of the Naval Yard, Simon's Town (which is masked by Muizen Berg, from the Observatory and King's Battery), and partly for local purposes. § 3. Tyger Berg Station.

The Beaufort theodolite was centered over *the angle point*.—September, October, 1845.

Names of Stations and Signals. Between		Observed Horizontal Angles. ° ′ ″	No. of Measures.	Weights.
Sneeuw Kop, pile.......	and Cape Point, pile.....	70·24·47·40	81	12·40
„ „ „	and Naval Yard, clock-tower	82·28·56·90	20	
„ „ „	and Naval Yard Station, hel.	82·31·50·19	50	324·45
„ „ „	and Admiralty House, hel.	82·48·28·30	30	
„ „ „	and Noah's Arc Rock, hel.	79·16·37·38	50	11·25
„ „ „	and Table Mountain, pile..	111·10·59·83	50	19·06
„ „ „	and Zwart Kop, pile......	77·31·19·55	90	7·36
„ „ „	and King's Battery, signal.	110·49·26·50	40	18·70
„ „ „	and Royal Obs., lantern-ball	109·56·39·97	40	14·02
„ „ „	and Royal Observatory, hel.	109·57·57·82	50	35·95
Kogel Berg, heliostat.....	and Cape Point, pile.....	42·37·31·04	41	12·07
„ „ „	and Zwart Kop, pile......	49·44· 1·18	35	1589·50
Zwart Kop, pile.........	and Table Mountain, pile..	33·39·40·43	40	5·68
Naval Yard, clock-tower..	and King's Battery, heliost.	28·20·29·33	20	
„ „ „	and Royal Obs., lantern-ball	27·27·40·73	10	
Naval Yard, trig. stat., hel.	and „ „ „	27·24·47·42	6	
„ „ „ „	and Pinnacle of Wesl. Chapel	0·11·42·48	12	
Royal Observ., lantern-ball	and Blaauw Berg, pillar...	90· 8·37·11	50	3·21
Royal Observatory, heliost.	and „ „ „	90· 7·22·58	50	20·34
King's Battery, heliostat..	and Lion's Rump, signal-st.	17·47·41·15	20	
„ „ „	and Robben Is., church-tower	53·49·18·88	20	
„ „ „	and Blaauw Berg, pillar...	89·15·49·73	30	23·76
Table Mountain, pile.....	and Robben Is., church-tower	53·27·49·09	40	14·09
Robben Isld., church-tower	and Blaauw Berg, pillar...	35·26·30·40	30	202·91
Blaauw Berg, pillar......	and Sneeuw Kop, pile....	159·54·42·91	30	3·02
Chimney on west side of Eerste River Bridge..	and Centre archway of Bridge	0· 2·33·44	4	
„ „ „	and King's Battery, heliostat	86·39·21·33	20	
„ „ „	and Zwart Kop, pile......	53·21·13·45	20	
„ „ „	and Col. Michel's house on Montagu Road.....	87·32·20·46	30	9·07
Simon's Berg, pile......	and Stellenbosch (an heliostat, placed on elevation above the town: town invisible......	18·46·34·75	10	
Stellenbosch, heliostat....	and King's Battery, heliostat	118·45·38·50	1	

Measured by Mr. Maclear.

17. Blaauw Berg, Azimuth Pillar Station.

§ 3. Blaauw Berg Station.

The position of the pillar is on the undulation, immediately to the east of the mountain named Blaauw Berg, distant nearly 13 miles north from the Royal Observatory. The pillar was built to serve as a permanent meridian mark for the 10-feet transit instrument; also for ascertaining the azimuths, by direct angular measurement of the trigonometric points, that are visible from the Observatory.

When observed from elevated distant stations, an heliostat was placed in line close to the pillar; and when angles were measured at the pillar, the theodolite was placed near to its south front, and require a reduction to the center.

Beaufort theodolite.—March, April, 1848.

$r = 20{\cdot}35$ feet. log. $r'' = 6{\cdot}62310$.

γ, or angle of direction, measured *from* the pillar towards the right.

STATIONS.	γ	Log. r″ sine γ.	Log distance.	Log reduction.	Reduction.
	° ′ ″				″
Riebeek's Kasteel	35·50·08	6·39060	5·26150	1·12910	+13·46
Sneeuw Kop	123·20·59	6·54496	5·27082	1·27414	+18·80
Tyger Berg	137·58·08	6·44887	4·71313	1·73574	+54·42
Kogel Berg	143·50·51	6·39390	5·33431	1·05959	+11·47
Cape Point	177·55·12	5·18294	5·34327	9·83967	+ 0·69
Royal Observatory	178·49·52	4·93272	4·83516	0·09756	+ 1·25
Muizen Berg............	181·16·38	4·97121			—
King's Battery	184·57·46	5·56016	4·87322	0·68694	— 4·86
Table Mountain, pile.......	189·53·49	5·85831	4·91245	0·94586	— 8·83
La Caille's Observatory.....	193·18·22	5·98508	4·81828	1·16680	—14·68
Lion's Rump, signal-staff ..	198·36·49	6·12714	4·81954	1·30760	—20·30
Kapoc Berg, cylindrical rock	347·17·30	5·96550	5·09202	0·87348	— 7·47

NAMES OF STATIONS AND SIGNALS.	Horizontal Angles observed at excentric Station.	Reduction to pillar.	Horizontal Angles reduced to pillars center.	No. of Observations.	WEIGHTS.
BETWEEN	° ′ ″	″	° ′ ″		
Sneeuw Kop, pile............... and Royal Observatory.........	55·28·52·60	— 17·55	55·28·35·05	110	21·74
” ” ” and Kogel Berg..................	20·29·51·65	— 7·33	20·29·44·32	10	
” ” ” and Cape Point, heliostat.......	54·34·11·18	— 18·11	54·33·53·07	60	35·07
” ” ” and King's Battery, pole........	61·36·47·72	— 23·66	61·36·24·06	10	
*Tyger Berg, pile............... and Royal Observatory, helios.	40·51·44·13	— 53·17	40·50·50·96	10	
Cape Point, pile .... and ” ” ”	0·54·40·32	+ 0·56	0·54·40·86	80	59·48
Royal Observatory, heliostat and Kapoc Berg, cylindrl. rock	168·27·38·10	— 8·72	168·27·29·38	10	
” ” ” and Muizen Berg, pile...........	2·26·45·76			30	2·97
” ” ” and Table Mountain, pile.......	11· 3·57·14	— 10·08	11· 3·47·06	100	6·19
” ” ” and La Caille's Observatory...	14·28·30·73	— 15·93	14·28·14·80	100	30·85
” ” ” and King's Battery..............	6· 7·54·39	— 6·11	6· 7·48·28	60	14·74
” ” ” and Signal-pole on the top of Blaauw Berg.............	43·56·52·05			50	6·75
La Caille's Observatory....... and Lions' Rump, signal-staff.	5·18·57·08	— 5·62	5·18·21·46	20	

The above angles were measured by Mr. Montagu.

* This angle was re-measured by Mr. Maclear in August 1857.

$r = 5{\cdot}354$ feet. log. $r'' = 6{\cdot}04310$.

§ 3. Blaauw Berg Station—(*continued*).

STATIONS.	γ	Log. r''. sine. γ	Log Distance.	Log Reduction.	Reduction.
	° ′ ″				″
Sneeuw Kop	116·51· 0	5·99356	5·27082	0·72274	+ 5·28
Tyger Berg	131·29· 0	5·91768	4·71315	1·20452	+16·01
Royal Observatory	172·19·56	5·16835	4·83514	0·33321	+ 2·15
Zwart Kop	174·29·20	5·02554	5·24238	9·78316	+ 0·61
King's Battery	178·27·24	4·47338	4·87322	9·60016	+ 0·40

The reduction for the left hand station, subtracted from the reduction for the right hand station, gives the reduction to the pillar.

NAMES OF STATIONS AND SIGNALS.	Observed Horizontal Angles.	Reduction to pillar.	Angles reduced to pillar.	No. of Observations.	Weights.
BETWEEN	° ′ ″	″	° ′ ″		
Sneeuw Kop, pile .... and Zwart Kop, heliostat	57·38·20·20	− 4·67	57·38·15·53	70	15·36
Tyger Berg, pile .... and Royal Observat., heliostat.	40·50·55·86	− 13·86	40·50·42·00	80	6·91

The above angles were measured by Mr. Maclear.

18. Simon's Berg Station.

Simon's Berg Station.

The circumstances of this station are not what were intended. When the Fuller theodolite was on Riebeek's Kasteel, a signalman was sent with an heliostat to the singular shaped knob on the west or lowest end of Simon's Berg; but on reaching the place he fancied that the theodolite tent could not be secured on the knob, he therefore chose a spot on the saddle between it and the next peak, within command of Riebeek's Kasteel,—but, unfortunately, not of Kapoc Berg. Hence, for observing Kapoc Berg, it became necessary to either adopt an excentric point or to re-visit Riebeek's Kasteel. He was mistaken in the belief that the theodolite could not be securely placed on the knob.

As the Observatory lantern interposed between the angular point, over the transit instrument and Simon's Berg, the Observatory heliostat was placed 10·242 feet to the north of the point; therefore, the correction $15''{\cdot}63$ has been subtracted from the theodolite readings for the heliostat, to reduce them to the angular point.

For the reduction to the center, where stations were compared with Kapoc Berg, $r = 15{\cdot}708$ feet.

$$\log. \frac{r}{\text{sine } 1''} = 6{\cdot}51052$$

§ 3. Simon's Berg Station—(*continued*).

STATIONS.	γ	Log. r″. sine. γ	Log. distance.	Log. reduction.	Reduction.
	° ′ ″				″
Table Mountain.........	202·48·22	6·09892	5·17897	0·91995	− 8·32
King's Battery..........	204·22·29	6·12616	5·15259	0·97357	− 9·41
Royal Observatory......	206· 4·50	6·15361	5·12417	1·02944	−10·70
Kapoc Berg............	263·22·40	6·50761	5·35124	1·15637	−14·33
Riebeek's Kasteel	300·28·28	6·44595	5·27628	1·16967	−14·78

The reduction for the left hand station, subtracted from the reduction for the right hand station, gives the reduction to the angle point.

BEAUFORT THEODOLITE.—NOVEMBER, 1845.

NAMES OF STATIONS AND SIGNALS.		Observed Horizontal Angles at excentric station.	Reduction.	Horizontal Angles observed at, or reduced to, trigonometric point.	No. of Observations.	Weights.
BETWEEN		° ′ ″	″	° ′ ″		
Cape Point, heliostat.........	and Table Mountain, pile......			40· 6·46·83	50	4·81
" " "	and King's Battery, heliostat.			41·40·49·30	80	103·88
Zwart Kop, pile................	and " "			31· 6·19·69	50	360·35
" " "	and Royal Observatory, hel....			32·48·19·52	100	80·29
" " "	and Table Mountain, pile......			29·32·17·13	50	17·15
King's Battery, heliostat......	and Royal Observatory, hel....			1·41·59·41	40	74·53
" " "	and Kapoc Berg, heliostat......	59· 0·12·03	− 4·92	59· 0· 7·11	80	7·05
Royal Observatory, heliostat	and Riebeek's Kasteel, pile....			94·23·48·77	50	18·50
" " "	and Rogge Bay, Guard-hs.,hel.			3· 0· 0·48	80	12·73
" " "	and Lion's Rump, signal-staff.			3·51·27·68	10	
" " "	and Tyger Berg, pile...........			13·20· 9·66	20	
" " "	and Kapoc Berg, heliostat......	57·18· 7·30	− 3·63	57·18· 3·67	158	8·38
Table Mountain, pile..........	and Tyger Berg, pile...........			16·36·12·41	18	
	and Kapoc Berg, heliostat......	60·34·18·49	− 6·02	60·34·12·47	80	9·71
Rogge Bay, Guard-house, hel.	and Riebeek's Kasteel, pile....			91·23·46·35	40	8·21
Tyger Berg, pile...............	and " " "			81· 3·41·89	20	
Kapoc Berg, heliostat.........	and " " "	37· 5·46·74	− 0·45	37· 5·46·29	90	7·55
Riebeek's Kasteel, pile.......	and Cape Point, heliostat.......			222·13·22·31	60	2·71
Naval Yard Clock.............	and Royal Observatory, helios.			28·19·16·52	10	
Muizen Berg, heliostat........	and Tyger Berg, pile...........			34·33·15·40	10	
" " "	and King's Battery, heliostat.			19·31· 2·68	20	

The above angles were measured by Mr. Maclear.

19. KAPOC BERG STATION.

Kapoc Berg Station.

The circumstances of this important station require to be particularly described.

Of the two rocks mentioned by La Caille in his journal, page 173, the larger was supposed to be the one to which he referred his angles, and the mistake was not discovered until after the terminal points of the Base had been connected with it; nothing, however, has been lost by the occurrence. The mistaken rock is a huge oblong mass of granite, of considerable elevation on the north-east side, separated into two unequal parts

Fig. 1.

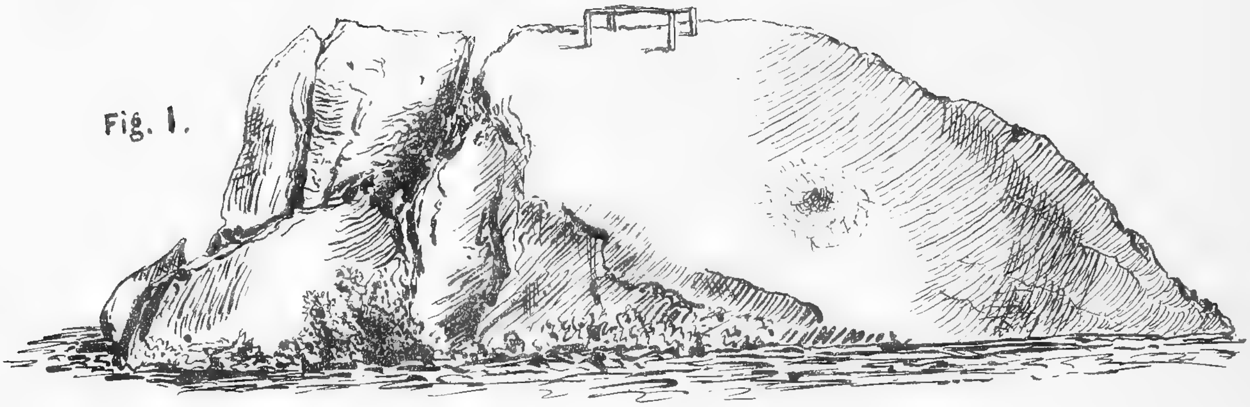
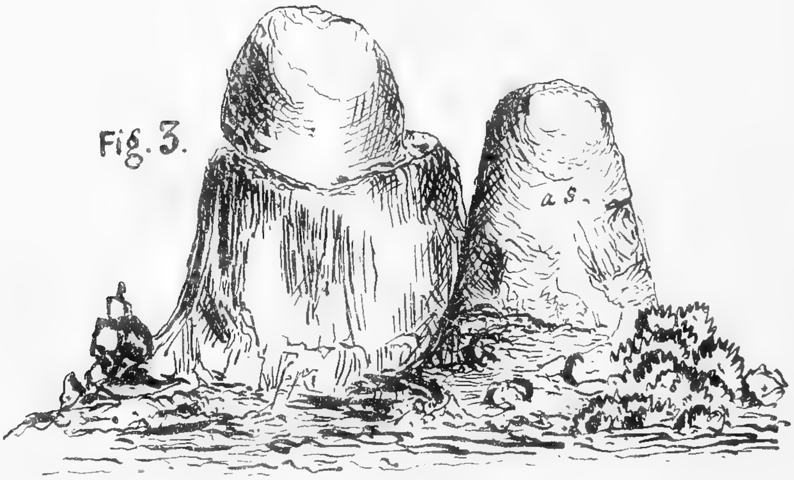


Fig. 2.

Fig. 3.



§ 3. Kapoc Berg Station-(*continued*). Signal-rock.

by a rent, the smaller part towards the north. "La place de ce signal est une grosse "roche appuyée d'une plus petite vers le nord." The smaller part was supposed to be the "plus petite vers le nord;" accordingly an angle point was established at a convenient part of the surface of the larger block, in the following manner: having chiselled out a square foot to a sufficient depth, a hole was drilled in the bottom of the hollow to receive a plug of lead, with a brass pin or stud in its center, and a piece of granite was nicely fitted to fill up the hollow,—yet sufficiently free for removal when necessary. *This brass pin defines the Kapoc Berg angle point of the modern triangulation,* and the rock has been named the *signal rock* in the field-books, and throughout the discussions.

Plate to the left.

Figure 1 of the plate to the left, represents the signal rock as viewed from the west, also the small stage which was keyed to it for supporting the heliostat, and subsequently the Beaufort theodolite.

La Caille's rock.

Bearing $78^{\circ}\cdot57'\cdot14''$ towards the right from Riebeek's Kasteel trigonometric point, and distant 127·73 feet (from center to center), stands the rock to which La Caille reduced his angles. It is a granite block of greater height than thickness, situated on the southern brow of the hill, from whence the ground declines rapidly. The face towards the south is flat, that towards the north is somewhat rounded, and upon its top rests a portion of a small block, which may have been entire in La Caille's time.

At the height of about two feet above the ground on the north side, the horizontal section is an irregular pentagon: the south face 10 feet, the east 3, the north-east 10, the north-west 5, and the west 6 feet.

Figure 2 represents its appearance as viewed from the south, and figure 3 as viewed from the direction of Riebeek's Kasteel, at the distance of 40 feet; also the "une plus petite vers le nord" of La Caille.

In the field-books, La Caille's rock is termed the *cylindrical* rock, though the resemblance to that figure is rather remote. A theodolite, with proper protection against sun and wind, could not be placed upon the top of this rock, without incurring a large and unjustifiable expense. La Caille did not attempt to place his quadrant upon it; but at various distances, between 11 and $13\frac{1}{2}$ feet to the north-west, on the ground below.

Signal-rock.

The engineering needed for establishing a large instrument on the *signal* rock is relatively trifling; but the south-east gales were in season during the first occupation of the station, and the danger of accident from their force—an accident that might put a stop to the survey for a time—was by no means improbable. The Fuller theodolite, therefore, occupied an excentric position on the ground, where its tent received partial shelter from the rock; but when Kapoc Berg was visited with the Beaufort theodolite, (an instrument capable of being quickly removed on the approach of danger) it was occasionally centered over the angle point on the rock.

§ 3. Kapoc Berg Station—(*continued*).

The distance between the center of the cylindric or La Caille's rock, and the angle point on the signal rock,—also the angle at the trigonometric or angle point between the line joining them, and the trigonometric point on Riebeek's Kasteel and other stations, have been determined with great care; therefore, the angles observed at the one can be reduced to the other with facility and precision. For this reason, the only angles measured close to La Caille's rock were between Riebeek's Kasteel and his Observatory, and between Riebeek's Kasteel and Rogge Bay Station,—and for no other purpose than to prove that the elements for reduction are correct.

Reduction of Angles observed at the Kapoc Berg Signal Rock, excentric Station, to the Angle Point on that Rock.

$$r = 31{\cdot}269 \text{ feet. } \log. \frac{r}{\text{sine } 1''} = \log. r'' = 6{\cdot}8095391.$$

(γ) the angle of direction, measured *from* the angle point towards the right.

STATIONS.	γ	Log. r″. sine γ.	Log. distance.	Log. reduction.	Reduction.
	° ′ ″				″
Groote Berg	27·35·19	6·4752325	4·9584945	1·5167380	+32·865
Patrys Berg..............	36·44·32	6·5863970	5·3731858	1·2132112	+16·338
West end of Base.........	56·52·53	6·7325453	4·7369159	1 9956294	+99·000
Klip Fontein, granary......	69·17·59	6·7805561	5·4206552	1·3599009	+22·903
,, ,, sector station.	69·20·15	6·7806642	5·4203176	1·3603466	+22·927
Piket Berg...............	73·49·40	6·7920043	5·4266080	1·3653963	+23·195
Kapitein's Kloof..........	75·40·25	6·7958189	5·4171664	1·3786525	+23·914
East end of Base..........	90·30·54	6·8095216	4·8794881	1·9300335	+85·120
Zwart Berg..............	96·54·24	6·8063761	5·1985625	1·6078136	+40·533
Winter Hoek.............	127·40·20	6·7080009	5 4074004	1·3006005	+19·980
Riebeek's Kasteel.........	143·11· 6	6·5871350	5·1328128	1·4543222	+28·466
Simon's Berg.............	200·15·44	6 3490131	5·3512429	0·9977702	− 9·949
Sneeuw Kop, H.H........	205·34·49	6·4447969	5·4578565	0·9869401	− 9·704
Royal Observatory	236·32·24	6·7308470	5·2771466	1·4537004	−28·425
King's Block-house Battery.	239· 5·44	6·7430391	5·2883707	1·4546684	−28·488
Rogge Bay, Guard-house...	241·25·35	6·7531227	5·2628136	1·4903091	−30·925
Table Mountain, pile.	241·26·44	6·7532133	5·3004387	1·4527746	−28·364
La Caille's Observatory....	241·27·27	6·7532625	5·2631265	1·4901360	−30·913
Robben Island, church-tower	246· 8·29	6·7707448	5 1560447	1·6147001	−41·181

The reduction for the left hand station, algebraically subtracted from the reduction for the right hand station, gives the reduction to the center. Thus the reduction to the center for the angle Riebeek's Kasteel—Royal Observatory $= + 28''{\cdot}466 - 28''{\cdot}425 = - 56''{\cdot}891$.

Horizontal Angles observed at Kapoc Berg Signal Station.

§ 3. Kapoc Berg Station—(*continued*).

NAMES OF SIGNALS AND STATIONS.	Fuller or Beaufort Theodolite.	Excentric or Central.	Horizontal Angles observed at excentric position.	Reduction to center.	Angles observed at, or reduced to, the center.	No. of Observations.	Weights and Partial Means.
BETWEEN			° ′ ″	″	° ′ ″		
Groote Berg, heliostat... and East end of Base, hel....	F	E	62·55·34·592	+52·255	62·56·26·847	34	34·00
West end of Base, pole. and " " " "	F	E	33·37·61·002	−13·880	33·37·47·122	58	58·00
East end of Base, heliost. and Riebeek's Kasteel, hel...	F	E	52·40·12·077	−56·650	52·39·15·427	49	49·00
Patrys Berg, heliostat... and Zwart Berg, heliostat....	F	E	60· 9·51·397	+24·195	60·10·15·592	81	81·00
" " " and Piket Berg, heliostat.....	B	E	37· 5· 9·300	+ 6·860	37· 5·16·160	130	32·25
" " " and Kapitein's Kloof, hel.....	B	E	38·55·51·440	+ 7·580	38·55·59·020	160	10·98
Klip Fontein, sect.st.,hel. and Granary Station, hel....	F	E	0· 2·16·768	+ 0·026	0· 2·16·794	23	23·00
" " " hel. and Riebeek's Kasteel, hel...	F	E	73·50·51·420	+ 5·539	73·50·56·959	49	49·00
" " grany.st.,h. and " " "	F	E	73·53· 7·178	+ 5·563	73·53·12·741	19	19·00
Piket Berg, heliostat.... and " " "	F	E	69·21·25·917	+ 5·271	69·21·31·188	41	41·00
Kapitein's Kloof.......... and " " "	B	E	67·30·40·500	+ 4·550	67·30·45·050	11	
" " and Winter Berg, heliostat...	B	E	51·59·56·500	− 3·934	51·59·52·566	100	100·70
Zwart Berg, heliostat.... and Riebeek's Kasteel, hel...	F	E	46·16·42·065	−12·067	46·16·29·998	40	40·00
" " pile.......... and " " pile..	B	E	46·16·42·090	−12·067	46·16·30·023	50	13·80
" " " and " " "	B	C			46·16·30·730	20	
(Mean)	B				(46·16·30·220)		20·30
Winter Berg, heliostat.. and Riebeek's Kasteel, pile...	B	E	15·30·46·247	+ 8·486	15·30·54·733	225	
" " " and " " "	B	C			15·30·54·770	30	
(Mean)	B				(15·30·54·737)	255	39·36
Winter Berg, heliostat.. and Sneeuw Kop, heliostat...	B	E	77·54·27·020	−29·684	77·53·57·336	50	3·08
" " " and " " "	B	C			77·53·58·010	80	22·84
" " " and " " "	B	C			77·53·56·720	100	6·68
" " " and " " "	B	C			77·53·56·660	100	3·46
" " " and " " "	B	C			77·53·57·040	100	5·93
" " " and " " "	B	C			77·53·57·370	100	15·65
(Mean)					(77·53·57·470	530	57·68)
Riebeek's Kasteel, hel... and Royal Observatory, hel..	F	E	93·21·18·356	−56·891	93·20·21·465	41	41·00
" " " and Rogge Bay, heliostat.....	F	E	98·14·18·622	−59·391	98·13·19·231	43	43·00
" " " and King's Block-h. Bat., hl.	F	E	95·54·38·303	−56·954	95·53·41·349	38	38·00
" " pile... and Simon's Berg, heliostat..	B	E	57· 4·37·700	−52·790	57· 3·44·910	100	6·45
" " " and Table Mountain, pile.....	B	E	98·15·38·830	−56·830	98·14·42·000	70	12·88
" " " and Sneeuw Kop, H.H., hel.	B	E	62·23·43·380	−38·170	62·23· 5·210	100	31·57
" " " and Dassen Berg, rock.........	B	C			58·22·36·200	30	4·05
Simon's Berg, heliostat. and La Caille's Observ., hel.	B	E	41·11·43·240	− 6·660	41·11·36·580	60	14·12
" " " and Royal Observatory, hel.	B	E	36·16·40·680	− 4·150	36·16·36·530	100	14·96
Sneeuw Kop, pile......... and King's Block-h. Bat., hel.	B	E	33·30·60·730	−18·780	33·30·41·950	110	43·72
" " " and Royal Observatory, hel.	B	C			30·57·21·430	100	42·10
Dassen Berg, rock...... and Blaauw Berg, pillar......	B	C			30·48·41·730	30	32·43
Tyger Berg, pile.......... and " " "	B	C			8·36·51·050	10	
Royal Observatory, hel.. and Table Mountain, pile.....	B	E	4·54·16·690	+ 0·060	4·54·16·750	145	43·71
" " " and Mouille Pnt. light-h., hel.	B	C			5·55·36·220	190	216·30
" " " and (Supplement)...............	B	C			354· 4·24·050	100	14·53
" " " and Winter Berg, heliostat...	B	C			251· 8·41·930	160	58·65
Mouille Pnt. light-h., hel. and " " "	B	C			245·13· 6·410	50	2·86
Table Mountain, pile..... and La Caille's Observ., hel..	B	E	0· 0·41·300	− 2·550	0· 0·38·750	100	29·28
" " " and Robben Isld., chu. tower	B	E	4·41·44·900	−12·840	4·41·32·060	10	
" " " and Patrys Berg, heliostat...	B	E	155·17·46·680	+44·700	155·18·31·380	20	
King's Block-h. Bat., hel. and Table Mountain, pile.....	B	E	2·20·59·760	+ 0·120	2·20·59·880	70	33·46
" " " " and Block House, niche......	B	E	0· 3·12·570		0· 3·12·570		

On the 5th of February, 1842, the Fuller theodolite was placed near *La Caille's rock*, for the purpose of measuring the angle between Riebeek's Kasteel trigonometric point and the Rogge Bay Station.

§ 3. Kapoc Berg Station—(*continued*).

$r = 12{\cdot}563$ feet. $r'' =$ log. $6{\cdot}41352$.

γ, for Riebeek's Kasteel $= 210^\circ{\cdot}13'{\cdot}41''$, and for Rogge Bay $308^\circ{\cdot}31'{\cdot}00''$.

$\therefore$ the reduction to La Caille's rock $= -11''{\cdot}077 - 9''{\cdot}610 = -1''{\cdot}467$.

Observed angle (46 measures, or 21 partial means) $= 98{\cdot}17{\cdot}18{\cdot}591$.

Angle reduced to La Caille's rock.............. $= 98{\cdot}17{\cdot}17{\cdot}124$.

On the 6th of February, 1846, the Beaufort theodolite was placed near La Caille's rock, for the purpose of measuring the angle between Riebeek's Kasteel trigonometric point and La Caille's Observatory.

$r = 13{\cdot}879$ feet. $\dfrac{r}{\text{sine } 1''} = 6{\cdot}45678$.

γ, for Riebeek's Kasteel $= 211^\circ{\cdot}45'{\cdot}15''$: for La Caille' Observatory, $310^\circ{\cdot}4'{\cdot}38''$

Hence, reduction to rock $= -11''{\cdot}957 - 11''{\cdot}098 = -0''{\cdot}859$.

Observed angle between Riebeek's Kasteel and La Caille's Observatory (100 repetitions, weight 22·84)...... $= 98{\cdot}19{\cdot}22{\cdot}67$.

Angle reduced to La Caille's rock $= 98{\cdot}19{\cdot}21{\cdot}81$.

The angles measured by means of the Fuller theodolite were effected by Mr. Maclear and Mr. Mann, conjointly; those with the Beaufort theodolite, in February, 1846, by Mr. Maclear,—and in 1847, by Mr. Montagu.

Reduction of Angles from Signal Rock to La Caille's Rock, Kapoc Berg.

$r = 127{\cdot}729$ feet. log. $\dfrac{r}{\text{sine } 1''} =$ log. $r'' = 7{\cdot}4207136$.

$\gamma =$ angle of direction, measured from La Caille's rock towards the right.

STATIONS.	γ	Log. r'' sine γ.	Log distance.	Log reduction.	Reduction.
Rogge Bay Guard-house.......	$19^\circ{\cdot}16'{\cdot}05''$	6·9392119	5·2625308	1·6766811	+ $47''{\cdot}499$
La Caille's Observatory........	19·18·07	6·9399461	5·2626271	1·6770367	+ 47·568
Patrys Berg..................	174·36·00	6·3943416	5·3734216	1·0209200	+ 10·492
Klip Fontein, granary	207· 9·33	7·0801201	5·4208540	1·6592661	− 45·633
" " sector station.....	207·11·49	7·0806778	5·4205180	1·6601598	− 45·726
Zwart Berg..................	234·46·16	7·3328581	5·1987691	2·1340890	−136·172
Riebeek's Kasteel, trigonom. point	281· 2·46	7·4125921	5·1327371	2·2798550	−190·482
Simon's Berg, excentric station..	338· 6·31	6·9922458	5·3510113	1·6412345	− 43·776
East end of Base.............	228·23·31	7·2944437	4·8799741	2·4144696	−259·699
West end of Base	194·45·44	6·8269271	4·7378979	2·0890292	−122·752

The reduction for the left hand station, algebraically subtracted from the reduction for the right hand station, gives the reduction to La Caille's rock.

20. East end of Base.

§ 3. East end of Base.

The Fuller theodolite centered over the terminal point.

Names of Stations and Signals. Between		Observed Horizontal Angles.	No. of Measures.	No. of Partial Means.
Zwart Berg, heliostat....	and Drie Fontein, heliostat.	86° 35′ 55″·155	119	44
,, ,, ,,	and Riebeek's Kasteel, hel.	74·18·35·656	65	30
Drie Fontein, heliostat...	and K. F. Contre Berg, hel.	63· 7·21·434	96	34
,, ,, ,,	and Kapoc Berg, signal-rck.	81·12·28·241	37	9
Kapoc Berg, signal-rock..	and West end of Base....	44·53·24·986	127	40
,, ,, ,,	and Groote Berg, heliostat.	66·57·32·989	86	22
K. F. Contre Berg, heliost.	and West end of Base....	62·58·29·910	60	28
Riebeek's Kasteel, heliostat	and Kapoc Berg, signal-rck.	93·29·48·396	91	39
Groote Berg, heliostat....	and Zwart Berg, heliostat..	125·14· 6·700	15	3

Heliostat signals on Riebeek's Kasteel, Zwart Berg, Drie Fontein, Groote Berg, and part of the time on Kapoc Berg; an upright having a slit, over the west terminal point, and a pole over K. F. Contre Berg. Generally bad definition.

Measured by Mr. Maclear.

21. West end of Base.

West end of Base.

The Fuller theodolite centered over the terminal point.

Names of Stations and Signals. Between		Observed Horizontal Angles.	No. of Measures.	No. of Partial Means.
East end of Base........	and K. F. Contre Berg....	77° 32′ 12″·824	135	53
,, ,, ,,	and Kapoc Berg, signal-rck.	101·28·48·550	89	42
K. F. Contre Berg......	and ,, ,, ,,	23·56·37·953	11	3

An heliostat signal over east terminal point, a 6-inch diameter cylindrical pole on Kapoc Berg, and on K. F. Contre Berg. Generally bad definition.

Measured by Mr. Maclear.

22. Klip Fontein, Contre Berg Station.

Klip Fontein, Contre Berg Station.

This station is upon a swell, near a farm-house.

The Fuller theodolite centered over the angle point.

Names of Stations and Signals. Between		Observed Horizontal Angles.	No. of Measures.	No. of Partial Means.
West end of Base.......	and East end of Base.....	39° 29′ 18″·196	94	46
East end of Base........	and Drie Fontein........	66·11· 0·071	90	44
Zwart Berg............	and Riebeek's Kasteel.....	52·51· 7·657	70	35

Heliostat signals over east end of Base, Drie Fontein, and Riebeek's Kasteel stations: an upright with slit over west end of Base. The east end heliostat badly served.

Measured by Mr. Maclear.

o

23. Riebeek's Kasteel Station.

§ 3. Riebeek's Kasteel Station.

The station is on the second peak, or crest, reckoning from the north.

The highest part of this crest consists of a sandstone crag, divided into blocks by fissures, more or less close.

The eastward face of the crest is a perpendicular precipice. La Caille's pile of stones stands on the small southernmost block, close to the edge of the precipice,—partly sheltered by Protea bush, growing out of the crevices of the rocks.

The position of the pile with respect to the edge of the precipice, is an important element in the discussion of the ancient with the modern determination of the distance between this pile and his rock on Kapoc Berg.

The area of the pile-rock not being large enough for the theodolite tent, and in other respects undesirable, the rock next to it was preferred for the modern trigonometric or angular point, leaving La Caille's pile undisturbed.

The Fuller theodolite was accordingly centered over the brass pin, marking the angle point for all angles measured on Riebeek's Kasteel, *which is the Riebeek's Kasteel trigonometric or angle point of the modern triangulation*, as the signal rock is of Kapoc Berg; and no other reference will be made to La Caille's pile than the reduction to it, for the purpose of verifying his angles, in which reduction we must assume that the axis of his quadrant coincided with the center of the pile. The reductions are as follows:—

Reduction to La Caille's pile on Riebeek's Kasteel, of Angles observed at the trigonometric or angle point.

$$r = 18 \text{ feet. } \log. \frac{r}{\text{sine } 1''} = \log. r'' = \log. 6{\cdot}5696976.$$

(γ) = angle of direction, measured *from* center of pile towards the right.

STATIONS.	γ	Log. r''. sine. γ	Log. distance.	Log. reduction.	Reduction.
	° ′ ″				″
Rogge Bay Guard house.....	111·10·10	6·5393541	5·3858028	1·1535513	+14·241
La Caille's Observatory......	111·11· 9	6·5393060	5·3859624	1·1533436	+14·234
Kapoc Berg, La Caille's rock.	159·20·12	6·1173200	5·1327918	0·9845282	+ 9·650
,, ,, signal rock......	159·23·22	6·1162576	5·1328519	0·9834057	+ 9·625
East end of Base............	193·14·20	5·9295551	5·0340561	0·8954990	− 7·861
Klip Fontein, fire...........	235·25·55	6·4853363	5·4163458	1·0689905	−11·722
,, ,, granary........	235·29· 1	6·4856059	5·4161869	1·0694190	−11·733
,, ,, Bradley's sector	235·29·40	6·4856624	5·4157577	1·0699047	−11·746

The reduction for the left hand station, algebraically subtracted from the reduction for the right hand station, gives the reduction to La Caille's pile.

Horizontal Angles observed at Riebeek's Kasteel angle point, with the Fuller theodolite. § 3. Riebeek's Kasteel Station—(*continued*).

NAMES OF STATIONS AND SIGNALS. BETWEEN		Observed Horizontal Angles. ° ′ ″	No. of Measures.	No. of Partial Means.
Royal Observatory, heliost.	and Kapoc Berg, signal-rock	52· 9·37·840	103	48
,, ,, ,,	and Klip Font., sector-stat..	128·15·53·583	6	3
King's Battery, heliostat. .	and Kapoc Berg, signal-rock	51· 8· 7·278	96	48
Rogge Bay, sector-stat., hel.	and ,, ,, ,, ,,	48·13·12·813	108	46
Lion's Rump, signal-staff.	and ,, ,, ,, ,,	46·49·50·330	16	8
*Robben Isld., church-tower	and ,, ,, LaCaille's rk.	39·39·16·276	20	10
Kapoc Berg, signal-rock . .	and East end of Base, hel..	33·50·58·524	112	54
,, ,, ,,	and Klip Fon., granary stat.	76· 5·39·295	52	26
,, ,, ,,	and Klip Fon., sector station	76· 6·18·263	74	35
,, ,, ,,	and Zwart Berg, heliostat..	76·53·24·494	102	51
,, ,, ,,	and Piket Berg, heliostat. .	80·32·39·364	55	27
,, ,, ,,	and Groote Berg, heliostat.	25· 5·36·760	31	14
,, ,, ,, exc. st.	and Kapoc Berg, signal-rock	0· 2·31·210	25	
,, ,, LaC's. r., exc. st.	and ,, ,, ,,	0· 0·28·237	25	
Kapoc B., La Caille's rock, h.	and East end of Base, hel..	33·54· 7·203	18	9
East end of Base, heliostat	and Zwart Berg, heliostat..	43· 2·26·661	98	49
Simon's Berg, heliostat. . .	and Kapoc Berg, signal-r., h.	85·50·32·384	72	36
Winter Berg, heliostat. . . .	and ,, ,, ,, ,,	181·50·19·245	20	10
Klip Fontein, granary, hel.	and Klip Fon., sector station	0· 0·38·090	8	

Heliostat signals were used at the several station points.

The above angles were measured by Mr. Maclear and Mr. Mann, between the 15th of February and 3rd of April, 1842.

24. Drie Fontein Station.

Drie Fontein Station.

The station is upon a sandy undulation, towards the Riebeek's Kasteel side of Zwartland plane. A stone, carrying a lead plug and brass pin, was sunk in the ground, and secured by ramming others firmly round it. The brass pin marks the angle point, over which the Fuller theodolite was centered.

Heliostat signals were employed at the observed stations.

Much inconvenience was experienced from the showers of sand, carried by strong wind at times into the theodolite tent while measuring.

NAMES OF STATIONS AND SIGNALS. BETWEEN		Observed Horizontal Angles. ° ′ ″	No. of Measures.	No. of Partial Means.
Klip Font., Contre Berg, h.	and East end of Base, hel..	50·41·39·632	73	36
East end of Base, heliostat.	and Zwart Kop, heliostat. .	48·43·36·350	78	35

Measured by Mr. Maclear, between the 8th and 11th of April, 1842.

* Reduction to Signal-rock $+3'\cdot10''\cdot48$.

25. Zwart Berg Station.

§ 3. Zwart Berg Station.

Zwart Berg is an oblong mountain running meridian-wise nearly, and commencing close to the left bank of the Berg River.

The station is on the southernmost (which is the most elevated) of the three connected masses of which the ridge is composed. As the surface consists of loose slate, a large stone was bored, and firmly bedded to receive the lead and brass pin which defines the angle point.

The Fuller theodolite was centered over the point.

Heliostat signals were employed at the observed stations.

Names of Stations and Signals.			Observed Horizontal Angles.	No. of Measures.	No. of Partial Means.
	Between		° ′ ″		
Riebeek's Kasteel, heliostat	and	Kapoc Berg, signal-rock	56·50· 8·849	114	57
,, ,, ,,	and	East end of Base, hel..	62·38·59·932	94	46
Drie Fontein, heliostat....	and	,, ,, ,, ,,	44·40·29·042	64	32
Kapoc Berg, signal-rock..	and	Patrys Berg, heliostat.	78·49· 2·386	79	38
Patrys Berg, heliostat....	and	Klip Font., sector-stat..	42·55· 4·186	75	37
,, ,, ,,	and	Piket Berg, heliostat..	51· 8· 7·380	73	36
Riebeek's Kasteel, heliostat	and	Patrys Berg, heliostat.	135·39·11·515	6	2
Klip Fontein, granary, hel.	and	Klip Font., sector-stat.	0· 1· 4·780	16	

Measured by Mr. Maclear and Mr. Smyth, between the 15th of April and 2nd of May, 1842.

26. Klip Fontein, the Locality of the North end of La Caille's Arc.

Klip Fontein, the locality of the north end of La Caille's Arc.

An elaborate account of the investigations, which were undertaken for the purpose of discovering the position of the granary at this locality wherein La Caille made his sector observations, is given in the first part of the present work; with a plan of the buildings then extant, and of the foundations of others of ancient date.

Plate II. Fig. 9. Fig. 13.

The Fuller theodolite was centered over the point on the corn floor, which marks the position of the axis of Bradley's sector in the year 1839; also over a point within the foundation supposed to be that of La Caille's granary, or sector station, in the year 1752.

The latter point is defined by a stone sunk in the ground and bedded in masonry, carrying a lead plug and brass pin.

By La Caille's account, his signal fire (which was also the position of his quadrant) was 36 toises *exactly west* of his sector: hence there is no difficulty in reducing angles measured at the granary station to his signal fire, when the azimuths of Riebeek's Kasteel and Kapoc Berg are known, nor of Bradley's sector station to the granary station, when the angles of direction and the distance between them have been measured.

Farm yard obstructions intervened between the sector and granary stations, but the small corn floor to the west commanded both. Here a point was taken up, from which the distance to both and the included angle were measured,—they were as follows: to the sector point 151·296 feet, to the granary point 269·970 feet, and the included angle $73^{\circ}\cdot23'\cdot1''\cdot7$.

§ 3. Klip Fontein, the locality of the north end of La Caille's Arc—(*continued*).

∴ the distance between the sector and granary points is 269·099 feet, which was checked by a rough measure over the intervening obstructions.

The angle between Zwart Berg and Patrys Berg is the only important one measured at the sector point.

$$r = 269{\cdot}099 \text{ feet.} \quad \log. \frac{r}{\text{sine } 1''} = 7{\cdot}7443369.$$

The angles of direction (γ) measured *from* the granary point round, in the order of increasing readings.

STATIONS.	γ	Log. r'' sine. γ.	Log Distance.	Log Reduction.	Reduction.
	° ′ ″				′ ″
Zwart Berg....	189·27·43·7	6·9602277	5·1569282	1·8032995	−1· 3·576
Patrys Berg....	283·21·13·2	7·7324332	5·1537117	2·5787215	−6·19·082

At the sector point the mean of 54 measures, or 27 partial means, gave for the angle between Zwart Berg and Patrys Berg........ 93·53·29·43

Reduction.................. −5·15·51

Angle reduced to the granary angle point........ 93·48·13·92

By an approximate calculation, the azimuth of Riebeek's Kasteel is $335^{\circ}\cdot20'\cdot57''\cdot68$, and of Kapoc Berg signal-rock point $5^{\circ}\cdot22'\cdot13''\cdot74$,—reckoning from the south point round by the west. The reduction from the trigonometric point on Riebeek's Kasteel to La Caille's pile, there (page 452) is $-11''\cdot73$, and from Kapoc Berg signal-rock point to cylindric rock centre (page 450) is $-45''\cdot63$. Applying these corrections to, and subtracting 90° from the azimuths, the angles of direction (γ) are found.

$$r = 36 \text{ toises} \times 6{\cdot}3945925. \quad \log r'' = 7{\cdot}6765405.$$

STATIONS.	γ	Log. r'' sine γ.	Log, Distance.	Log. Reduction.	Reduction.
	° ′ ″				′ ″
Riebeek's Kasteel.	245·20·45·95	7·6350299	5·4163458	2·2186841	−2·45·457
Kapoc Berg......	275·21·28·11	7·6746389	5·4208079	2·2538310	−2·59·404

§ 3. Klip Fontein, the locality of the north end of La Caille's Arc—(*continued*).

∴ the reduction to the signal fire $= -0' 13''.95$.

The mean of 72 measures, or 36 partial means, of the angle at the granary angle point, between Riebeek's Kasteel and Kapoc Berg, is $30^\circ 1' 16''.188$, and the reductions to La Caille's pile on the one, and to his rock on the other, are $+11''.73$ and $-45''.63$. (La Caille's stations on Riebeek's Kasteel and Kapoc Berg are to the *left* of the modern points, as viewed from Klip Fontein).

Consequently, Observed angle at granary point......	$30^\circ 1' 16''.19$
Reduction to signal fire.............	-13.95
Reduction to his points, as above......	-33.90
Angle at La Caille's signal fire, between his Riebeek's Kasteel and Kapoc Berg stations...........	$30.0.28.34$

Referring to the Memoirs of the Academy of Sciences, year 1751, page 432. La Caille's numbers for calculation are $29^\circ 59' 56''$. Adding $2''.7$ for spherical excess, his observed angle becomes $29^\circ 59' 58''.7$, differing by $29''.6$ from the above result.

The difference is discussed in another part of this work, in conjunction with the other angles and sides of this triangle, where there is evident proof of La Caille's sector position having been within a building still existing and inhabited, 25 yards to the north-west of the assumed granary point.

	° ′ ″
Returning to the angles observed at the granary,—the mean of 80 measures, or 40 partial means, of the angle between Zwart Berg and Patrys Berg, is..	93.48.12.99
The angle between these stations, observed at the sector point, reduced to the granary point (27 partial means)	93.48.13.92
Mean (Weight 67)....	93.48.13.37

The above angles were measured by Mr. Maclear and Mr. Smyth, between May 5 and June 3, 1842.

Heliostat signals were employed at the several stations.

27. Piket Berg Station.

Piket Berg Station.

The point was taken up by a signalman, who was sent from Kapoc Berg with an heliostat, and instructions to select the highest part of the range. The conditions were not strictly carried out, but the station commands an important elevation to the north-west, which it masks from the highest point. On the other hand, the latter masks an important elevation to the south-east,—therefore it became necessary to occupy both.

§ 3. Piket Berg Station—(*continued*).

The Fuller theodolite centered over the terminal point.

NAMES OF STATIONS AND SIGNALS. BETWEEN		Observed Horizontal Angles. ° ′ ″	No. of Measures.	No. of Partial Means.
Riebeek's Kasteel, heliost.	and Kapoc Berg, heliostat.	30· 5·58·070	49	24
,, ,, ,,	and Patrys Berg, heliostat.	91·10·50·140	8	4
{ Kapoc Berg, heliostat....	and ,, ,, ,,	61· 4·47·512	67	33 }
{ ,, ,, ,,	and ,, ,, ,,	61· 4·47·851	120	60 }
Zwart Berg, heliostat.....	and ,, ,, ,,	88· 2·37·852	80	37
{ Patrys Berg, heliostat....	and Eland's Berg, heliostat.	83·57·34·188	104	52 }
{ ,, ,, ,,	and ,, ,, ,,	83·57·35·328	120	60 }
{ Eland's Berg, heliostat...	and Lambert's Hoek Berg, h.	52·20·34·365	53	27 }
{ ,, ,, ,,	and ,, ,, ,, ,,	52·20·32·636	120	60 }
,, ,, ,,	and Heerenlogement's B., h.	26·57·12·804	40	20
,, ,, ,,	and Ceder Berg, heliostat..	81·58·18·009	120	60
Heerenlogement's Berg, h.	and ,, ,, ,,	55· 1· 4·432	120	60
Lambert's Hoek Berg, hel.	and ,, ,, ,,	29·37·44·749	40	20
Ceder Berg, heliostat.....	and Zwart Berg, pile.....	106· 1·26·885	40	20
,, ,, ,,	and Kapoc Berg, heliostat.	132·59·20·370		
Lambert's Hoek Berg, hel.	and Kapoc Berg, heliostat.	162·37· 3·276	40	20
Kapoc Berg, heliostat....	and Eland's Berg, heliostat.	145· 2·24·810	40	20
Eland's Berg, heliostat...	and Niche B............	116·30·17·007	24	12
,, ,, ,,	and a remarkable Rock...	112·47·36·550	8	4

The observations for including *Tafel Berg* and *West End* in the triangulation are not published, because neither of them are visible from the Ceder Berg station.

The above angles were measured by Mr. Maclear and Mr. Smyth, between June 5 and 21, 1842; December 26, 1843, to February 22, 1844.

28. Kapitein's Kloof Station.

Kapitein's Kloof Station.

This is the second station on Piket Berg, before alluded to, taken up because it commands Winter Berg, which is visible from the Ceder Mountain station, and shuts out Winter Berg from the first station on Piket Berg. The name of the adjacent pass *(Kapitein's Kloof)* is given to it for distinction.

The Fuller theodolite centered over the terminal point.

NAMES OF STATIONS AND SIGNALS. BETWEEN		Observed Horizontal Angles. ° ′ ″	No. of Measures.	No. of Partial Means.
Riebeek's Kasteel, heliost..	and Kapoc Berg, heliostat.	30·55·38·791	160	80
Kapoc Berg, heliostat....	and Patrys Berg, heliostat.	62·23·20·631	160	80

§ 3. Kapitein's Kloof Station —(*continued*).

Kapoc Berg, heliostat....	and Donkin's Bay, heliostat	149·57·45·470	4	2*
Patrys Berg, heliostat....	and „ „ „	87·34·35·100	4	2*
„ „ „	and Heerenlogement's B., h.	106·10·19·919	120	60
Heerenlogement's Berg, h.	and Ceder Berg, pile......	54· 2·38·846	160	80
Ceder Berg, pile........	and Winter Berg, heliostat.	74·42·47·233	160	80
Winter Berg, heliostat....	and Riebeek's Kasteel, hel.	31·45·16·584	160	80

The angles were measured by Mr. Smyth, between April 22 and May 25, 1844.

Heliostat signals over the several station points except the Ceder Berg, where the excentric pile was observed.

Reduction from the Ceder Berg pile to the angle point of that station, for the angle with Winter Berg $= -15''\cdot67$; for Heerenlogement's Berg $= +15''\cdot67$ (see Ceder Berg station, No. 33); hence these angles become $74^\circ\cdot43'\cdot2''\cdot903$ and $54^\circ\cdot2'\cdot23''\cdot176$.

29. Winter Berg Station.

Winter Berg Station.

This is one of the remarkable commanding masses of the eastern range. "The ground round the station was very uneven: one foot of the theodolite trestle rested on the station rock (of no great size), one on an iron picket, and one on a block of stone put into a hole to bring up to the level. North winds were frequent and violent. The cold was very great during the first half of the time, when the tents were generally coated with snow."

The Fuller theodolite centered over the angle point.

NAMES OF STATIONS AND SIGNALS. BETWEEN		Observed Horizontal Angles.	No. of Measures.	No. of Partial Means.
		° ′ ″		
Kapitein's Kloof, heliostat.	and Ceder Berg, pile......	52·15·11·068	160	80
Ceder Berg, pile........	and Sneeuw Kop, H.H., hel.	187·15·52·545	160	80
Sneeuw Kop, H.H., hel..	and Kapoc Berg, heliostat.	55· 9·32·323	160	80
Kapoc Berg, heliostat....	and Kapitein's Kloof, helios.	65·19·23·769	160	80
„ „ „	and Zwart Berg, heliostat..	36·18· 1·114	16	8
Riebeek's Kasteel, pile...	and Ceder Berg, pile......	133·48·58·529	40	20
Royal Observatory, heliost.	and Riebeek's Kasteel, pile.	13·15·25·241	24	12

The angles were measured by Mr. Smyth, between July 9 and October 10, 1844.

Reduction from the Ceder Berg pile to the angle point, for the angle with Kapitein's Kloof, Sneeuw Kop, H.H., and Riebeek's Kasteel $= 9''\cdot073$; hence these angles become $52^\circ\cdot15'\cdot1''\cdot995$, $187^\circ\cdot16'\,1''\cdot618$, and $133^\circ\cdot48'\cdot49''\cdot456$. (See Ceder Berg Station, No. 33.)

* Angle (γ) at theodolite station between Kapoc Berg and a temporary station that commands Donkin's Bay, $124^\circ\cdot43'$. Distance 21·67 feet.

30. Patrys Berg Station.

Patrys Berg is the comparatively low whale-backed granite mountain, at the south end of St. Helena Bay. The trigonometric point is on a flat block of granite, even with the common surface, and is defined as usual by a cylinder of lead and brass pin. § 3. Patrys Berg Station.

At the first visit in June, 1842, the angles were measured under unfavorable circumstances, owing to the detachment of soldiers having been re-called for military duty, and the signal stations, therefore, could not be occupied simultaneously. When visited in August, 1846, Messrs. Campion and Montagu had instructions to measure each angle separately, as usual: also combined, viz., bisecting the several signals in succession, then shifting the microscopes a given number of degrees, and so on round the circle. The results from the latter method proved so discordant that no use has been made of them: while the experiment confirms the necessity of stepping the divisions of the Fuller theodolite without a break. The discordant measures are not printed.

The Fuller theodolite centered over the angle point.

NAMES OF STATIONS AND SIGNALS.	BETWEEN	Observed Horizontal Angles. ° ′ ″	No. of Measures.	No. of Partial Means.
Kapoc Berg, heliostat....	and Referring hole.......	134·16·41·77	74	36
Eland's Berg, heliostat...	and Piket Berg, heliostat..	44 48·35·40	81	40
Kapitein's Kloof, pile....	and Kapoc Berg, heliostat..	78·40·51·71	116	51
Piket Berg, heliostat.....	and Zwart Berg, heliostat..	40·49·18·04	79	36
Referring hole..........	and La Caille's Granary, hel.	141·24·41·48	74	34
Referring hole..........	and Zwart Berg, heliostat..	184·42·31·14	82	41
Zwart Berg, heliostat....	and Kapoc Berg, heliostat..	41· 0·47·99	152	60

The "referring hole" is a natural aperture in a gigantic group of rocks near St. Helena Bay, through which the sky is seen.

The measures in 1842 by Mr. Maclear, those in 1846 by Messrs. Campion and Montagu.

31. Eland's Berg Station.

Eland's Berg is a flat-topped hill, or table land, situated near the north end of St. Helena Bay. The Verloren Valei outlet to the sea passes close to its northern precipitous end. Owing to the flatness of the top, and the thick bush that covers it, a spot could not be found which would command an uninterrupted view of the sea and of the inland stations. From the station selected near its northern extremity, the sea is visible at the mouth of the Berg River, and northward in the direction of Lambert's Cove and Donkin's Bay. The point is near the centre of a blotch of naked sandstone rock, which is even with the surface of the ground, and is marked in the usual way by a cylinder of lead and brass pin. Eland's Berg Station.

§ 3. Eland's Berg Station—(*continued*).

The Fuller theodolite centered over the angle point.

NAMES OF STATIONS AND SIGNALS. BETWEEN		Observed Horizontal Angles. ° ′ ″	No. of Measures.	No. of Partial Means.
Heerenlogement's Berg, h.	and Lambert's Hoek Bg., h.	58·41·16·91	124	62
,, ,, ,,	and Referring hole.......	84·14·11·85	124	61
,, ,, ,,	and ,, niche......	84·14·27·17	80	40
,, ,, ,,	and Ceder Berg, heliostat..	63·43·19·27	160	80
Lambert's Bay, heliostat..	and Heerenlogement's B., h.	37·29·22·02	16	8
Lambert's Hoek Berg, hel.	and Piket Berg, heliostat..	67·45·33·27	106	53
,, ,, ,, ,,	and Referring hole.... ..	25·32·54·63	100	50
Piket Berg, heliostat.....	and Patrys Berg, heliostat.	51·13·56·02	66	33
Referring niche.........	and ,, ,, ,,	93·26·18·60	62	31
,, ,,	and Piket Berg, heliostat..	42·12·21·99	130	64
,, ,,	and ,, ,, ,,	42·12·21·23	80	40
,, hole..........	and ,, ,, ,,	42·12·40·12	128	64
,, ,,	and Referring niche......	0· 0·16·74	96	48
Ceder Berg, heliostat.....	and Piket Berg, heliostat..	62·43·29·58	160	80
,, ,, ,,	and Referring niche......	20·31· 9·01	80	40

The measures between January 9 and February 2, 1843, by Mr. Maclear and Mr. Mann,—those of subsequent date by Mr. Smyth.

32. Lambert's Hoek Berg Station.

Lambert's Hoek Berg Station.

The fertile Lang Valei, stretching eastward from the sea-shore through a sandy desert, is suddenly brought to a close by two whale-shaped, ridge-topped, elevations of sandstone, at a corner named Alexander's Hoek. From the summit of the north-eastern of the two, the view to the eastward is magnificent: in the vale below, the Olifant's River pursues its northerly course, nearly insulating the little town of Clanwilliam. Beyond, the gigantic masses of the Ceder Bergen extend across with imposing grandeur.

The station is on the north-eastern (Lambert's Berg), marked as usual by a cylinder of lead carrying a brass pin, inserted in a rock.

The Fuller theodolite centered over the angle point.

NAMES OF STATIONS AND SIGNALS. BETWEEN		Observed Horizontal Angles. ° ′ ″	No. of Measures.	No. of Partial Means.
Eland's Berg, heliostat...	and Heerenlogement's B., h.	65·47· 8·49	141	70
,, ,, ,,	and Referring niche......	155·40·40·21	160	80
Heerenlogement's Berg, h.	and ,, ,,	89·53·31·84	127	63
,, ,, ,,	and Joachim's Neus, top...	149·10·44·23	7	

Klip Rug Kop, peak.....	and Referring niche......	24·56·59·80	6		§ 3. Lambert's Hoek Berg Station—(*continued*).
Lambert's Cove, heliostat.	and ,, ,,	124·16·39·75	40	20	
Piket Berg, heliostat.....	and Eland's Berg, heliostat.	59·53·53·75	122	60	
,, ,, ,,	and Referring niche......	144·25·25·80	66	30	
*Clanwilliam, heliostat....	and ,, ,,	25·53·54·27	4		
Referring niche.........	and Peak on Ceder Berg..	37·24·42·80	6		

The angles at this station were measured by Mr. Maclear and Mr. Mann.

33. Ceder Berg Station.

The station is upon the highest part of Sneeuw Kop, in the center of a sort of dish or cup, nine feet in diameter, hollowed out of the rock by the action of the weather, and is marked by a brass pin in the center of a cylinder of lead, let into a hole drilled in the rock. Ceder Berg Station.

The Fuller theodolite centered over the terminal point.

NAMES OF STATIONS AND SIGNALS. BETWEEN		Observed Horizontal Angles. ° ′ ″	No. of Measures.	No. of Partial Means.
Kapoc Berg, heliostat....	and Eland's Berg, heliostat.	60·52·41·45	17	8
Donkin's Bay, heliostat...	and Heerenlogement's B., h.	8·52·45·83	10	5
,, ,, ,,	and Referring hole.......	24·29·39·05	7	4
Eland's Berg, heliostat...	and Heerenlogement's B., h.	35·39·29·94	160	80
,, ,, ,,	and Donkin's Bay, heliostat	26·46·41·69	20	10
Heerenlogement's Berg, h.	and Referring hole.	15·36·53·92	60	30
,, ,, ,,	and Klip Rug, heliostat...	66·43·28·36	101	50
Lambert's Hoek Berg, pile	and Referring hole.......	45·33·15·04	32	16
Piket Berg, heliostat.....	and Eland's Berg, heliostat.	35·18·16·03	68	34
,, ,, ,,	and Donkin's Bay, heliostat	62· 5· 2·46	5	3
,, ,, ,,	and Heerenlogement's B., h.	70·57·46·15	22	10

The "referring hole" is a natural opening in a distant group of rocks.

The Beaufort theodolite centered over the angle point.

				Weights.
Winter Berg, heliostat....	and Kapitein's Kloof, pile..	53· 2·11·18	400	59·36
Kapitein's Kloof, pile....	and Heerenlogement's B., h.	73·31·44·90	800	43·71
Klip Rug, heliostat......	and Winter Berg, heliostat.	166·42·35·28	400	29·89
,, ,, kop..........	and ,, ,, ,,	165·17·23·49	160	7·48

* The light was given from the Civil Commissioner's house, situated at the south end of the town.

§ 3. Ceder Berg Station—(*continued*).

On leaving the station in the beginning of April, 1843, a signal pile of dry stones was built with care, in the form of a truncated cone, on the south side of the station point, in order that it might be used if, from the severity of the winter, the station could not be held by a signalman, thus leaving the station point open for an heliostat, if practicable.

	ft. in.
Circumference of top of pile	$19{\cdot}7\frac{1}{2}$
,, ,, base of pile	$38{\cdot}0\frac{1}{2}$
Nearest distance between base of pile and station point	$11{\cdot}1\frac{5}{8}$

Theodolite reading for center of pile, derived from the reading for both edges = $189^\circ{\cdot}0'$

,, ,, ,, Lambert's Hoek Berg, pile = 330·5

Hence γ, or angle of direction, for Lambert's Hoek = 141·5

$r = 17{\cdot}184$ feet. log. $'' = 6{\cdot}5495241$.

Combining the several angles with γ for Lambert's Hoek Berg, we obtain:—

γ for Winter Berg	= $44^\circ{\cdot}27'{\cdot}25''$.	Reduction from pile to station point	$9''{\cdot}073+$
,, Kapitein's Kloof	= 97·29·36.	,, ,, ,, ,,	15·670+
,, Piket Berg	= 100· 3·35.	,, ,, ,, ,,	15·428+
,, Eland's Berg	= 135·21·51.	,, ,, ,, ,,	9·882+
,, Heerenlogement's Berg	= 171· 1·21.	,, ,, ,, ,,	2·415+
,, Klip Rug	= 237·44·50.	,, ,, ,, ,,	11·034−

The reduction to be subtracted from the theodolite reading (at these stations) for the bisection of the pile, to obtain the reading for the station point.

The angles at the Ceder Berg, measured with the Fuller theodolite, were effected by Mr. Maclear and Mr. Mann,—those with the Beaufort theodolite by Mr. Montagu.

34. Heerenlogement's Berg Station.

Heerenlogement's Berg Station.

Heerenlogement's Berg, or Gentleman's-hotel Mountain, is an isolated mountain on the path to the north-west frontier.

At about half of its height from the base the mountain is divided by a ravine, running S.E. and N.W., into two crests of rugged sandstone, where the process of disintegration, aided by the south-east wind *(a)*, has channeled out the softer material, leaving the harder in the form of long walls in the direction of the current. The crest to the northward being the higher of the two, was selected for the trigonometric station.

The point is marked by a cylinder of lead, having a brass pin in its center, over which the Fuller theodolite was centered in April and May, 1843, and October, 1847.

(a) The dry south-east wind acts more powerfully upon sand-stone, than the moist north-wester.

Observed Horizontal Angles at Heerenlogement's Berg.

§ 3. Heerenlogement's Berg Station—(*continued*).

NAMES OF STATIONS AND SIGNALS. BETWEEN		Observed Horizontal Angles.	No. of Measures.	No. of Partial Means.
Bokkeveld's Berg, heliostat	and Klip Rug, heliostat...	41° 56′ 13″·84	80	40
„ „ „	and Ceder Berg, pile (red.)	105·56·45·06	54	27
Eland's Berg, heliostat....	and Donkin's Bay, heliostat	68·54·34·83	20	10
„ „ „	and Louis Fontein, heliostat	123·34·58·35	80	40
Eland's Hoogte, heliostat.	and Bokkeveld's Berg, hel.	37·51·30·32	100	50
Klip Rug, heliostat	and Ceder Berg, heliostat..	64· 0·29·81	60	30
„ „ „	and „ „ pile (red.)	64· 0·29·17	20	10
„ „ kop	and „ „ heliostat..	63·39·50·97	6	3
„ „ „	and „ „ „	63·39·53·22	20	10
Lambert's Hoek Berg, hel.	and Eland's Berg, heliostat	55·31·38·25	128	50
Louis Fontein, heliostat...	and Ceder Berg, pile (red.)	155·47·44·52	100	50
„ „ „	and Bokkeveld's Berg, hel.	49·50·57·68	80	40
Piket Berg, pile	and Heerenl. B., sector stat.	137·45·55·43	8	4
Referring niche (1)......	and Ceder Berg, pile (red.)	9· 8· 1·39	4	2
„ „ (1)......	and „ „ „ „	9· 8· 9·26	4	
„ „ (2)......	and „ „ „ „	7· 4·49·05	56	28
„ „ (2)......	and Piket Berg, heliostat..	61· 6· 8·22	18	9
Ceder Berg, pile (reduced)	and Joachim's Neus......	9·54·36·21	36	18
Ceder Berg, heliostat....	and Kapitein's Kloof, pile..	52·26· 6·12	80	40
„ „ „	and Piket Berg, pile......	54· 1·20·07	60	30
Sector Station, Heerenl. B.	and Ceder Berg, heliostat...	168·12·44·50	16	8
Ceder Berg, heliostat.....	and Eland's Berg, heliostat.	80·37·16·28	82	40
„ „ pile (reduced)	and „ „ „	80·37·18·03	80	40
Subtense of 20 feet across the sector station point, from which point the line to the theodolite station point is perpendicular to the 20 feet		2·17· 7·78	20	10

The angles measured at this station, in 1843, were by Mr. Mann and Mr. Maclear, those of subsequent date by Mr. Campion.

The observations for latitude, with Bradley's sector, were made by Mr. Maclear. The observations with the 30-inch transit by Mr. Mann.

35. Klip Rug Station.

Klip Rug Station.

The station is on the top of a low clayey hill, and the lead plug is in a very hard blue round stone, about three feet in diameter, sunk into the ground and well rammed in on all sides. The stand of the instrument rested on hard clay.

NOTE.—When the Ceder Berg *pile* was observed at any station, the correction from page 462 was applied, as there indicated, to reduce to the Ceder Berg trigonometric point.

§ 3. Klip Rug Station—(*continued*).

A pile, 10 feet in diameter at the base and 10 feet high, was built over the point after removing the instrument.

There is a remarkable group of rocks on the east end of the hill, named in the books "Klip Rug Knob."

The Fuller theodolite centered over the angle point.

NAMES OF STATIONS AND SIGNALS. BETWEEN		Observed Horizontal Angles. ° ′ ″	No. of Measures.	No. of Partial Means.
Heerenlogement's Berg, h.	and Bokkeveld's Berg, hel.	80·10·11·19	160	80
„ „ „	and Conical Hantam Berg.	157·19·42·09	16	8
Referg. n., in Ceder Bergen	and Bokkeveld's Berg, hel.	102·49·32·91	80	40
„ „ „ „	and Heerenlogement's B., h.	22·39·21·30	80	40
Ceder Berg, pile (reduced)	and Referring niche......	26·36·51·94	40	20
„ „ heliost......	and „ „	26·36·52·34	40	20
„ „ „ „	and Heerenlogement's B., h.	49·16·13·29	160	80

The angles at this station were measured by Mr. Smyth, between September 19 and 28, 1843.

36. Bokkeveld's Berg Station.

Bokkeveld's Berg Station.

The station is on the top of a table mountain, the lead cylinder in a mass of very brittle ironstone, of small size; two feet of the stand of the instrument rested on the ground, and the third on an iron picket driven through the iron stone. The referring niche was in the Hantam Berg.

A pile, 20 feet high and 15 feet in diameter at the base, was erected over the station point after the observations were made.

The Fuller theodolite centered over the angle point.

NAMES OF STATIONS AND SIGNALS. BETWEEN		Observed Horizontal Angles. ° ′ ″	No. of Measures.	No. of Partial Means.
Eland's Hoogte, heliostat	and Referring niche......	193·56·57·79	80	40
„ „ „	and Kamies-Sec. B., W.R., h.	51· 6·41·33	160	80
Heerenlogement's Berg, h.	and Eland's Hoogte, heliost.	65· 6·27·68	160	80
„ „ „	and Louis Fontein, heliostat	76· 9·45·71	160	80
Kamies-Sector B., W.R., h.	and Referring niche......	142·50·16·60	80	40
„ „ „ „ „	and „ „	142·50·17·21	80	40
„ „ „ „ „	and Keibiskow, heliostat...	89·48·55·92	160	80
Keibiskow (supplemty.), h.	and Kamies-Sec. B., W.R., h.	270·11· 2·29	40	20
Keibiskow, heliostat......	and Referring niche......	53· 1·19·73	132	60
„ „	and Klip Rug, pile.......	96· 4· 5·70	24	12
„ „	and „ „ heliostat...	96· 4· 6·52	60	30
„ „	and „ „ kop.......	94·13·43·68	20	10
Klip Rug, heliostat......	and Heerenlogement's B., h.	57·53·47·50	160	80

§ 3. Bokkeveld's Berg Station—(*continued*).

Louis Fontein, heliostat...	and Kamies-Sec.B.,W.R.,h.	40· 3·24·21	160	80
Referring niche.........	and Louis Fontein, heliostat	177· 6·19·03	80	40
,, ,,	and Klip Rug, heliostat...	43· 2·46·33	80	40
,, ,,	and ,, ,, kop.......	41·12·19·94	16	8
,, ,,	and Heerenlogement's B.,h.	100·56·33·09	80	40
,, ,,	and Conical Hantam Berg..	6·57·36·65	24	12

The term Kamies Berg here means the elevation, generally termed Kamies-Sector Berg. The Kamies Bergen consist of several elevations which have separate names, as "Welcome," "Ezels Kop," &c.

The angles at this station were measured by Mr. Smyth, and by Messrs. Campion and Montagu.

37. Louis Fontein Station.

Louis Fontein Station.

On the left hand side of the road leading from the Olifant's River to the Kamies Bergen, over the Hardevelt, there is a whale-backed granite hill, with a farm-house at its base, named Louis Fontein.

The station is on the top of the hill, in the middle of a large flat granite rock, marked as usual by a cylinder of lead, carrying a brass pin, let into the rock.

The Fuller theodolite centered over the terminal point.

Names of Stations and Signals.	Between	Observed Horizontal Angles.	No. of Measures.	No. of Partial Means.
		° ′ ″		
Bokkeveld's Berg, heliostat	and Heerenlogement's B.,h.	53·59·39·01	160	80
Ezel's Kop, heliostat.....	and (a) Kamies-Sect. Berg, West Rock, heliost.	4·29·14·66	180	80
,, ,, ,,	and Referring niche......	2·11· 6·98	40	20
Kamies-Sector Berg, (red. to West Rock), heliost.	and Bokkeveld's Berg, hel.	87·43· 1·86	160	80
Kamies-Sector B.,W.R.,h.	and Kamies-S. B., theod.,h.	0· 2·20·39	200	100
Referring niche.........	and Heerenlogement's B.,h.	144· 0·49·05	160	80
,, ,,	and Bokkeveld's Berg, hel.	90· 1· 9·38	160	80
,, ,,	and Kamies-Sect. B., theod. (red. to W.R.), hel.	2·18· 8·13	80	40
,, ,,	and Kamies-Sec.B.,W.R.,h.	2·18· 8·32	86	41
Roodewal, heliostat......	and ,, ,, ,, ,, ,,	54·59·15·86	172	80
Kamies-Sector B.,W.R.,h.	and Roodewal, heliostat...	305· 0·43·78	80	40
Roodewal, heliostat......	and Ezel's Kop, heliostat..	50·30· 1·77	120	60
,, ,,	and Referring niche......	52·41· 9·29	62	31

The referring niche is a natural cleft in a group of rocks on the top of "Welcome," Kamies Berg.

The angles at this station were measured by Mr. Smyth, and by Messrs. Campion and Montagu.

(a) The west rock station will be described, with the other particulars of the Kamies Berg (Sector Berg) station.

38. Eland's Hoogte Station.

§ 3. Eland's Hoogte Station.

Eland's Hoogte is a low smooth hill in the Hardevelt, with small patches of granite here and there. The plug marking the station point is in one of these patches.

The Fuller theodolite centered over the angle point.

Names of Stations and Signals. Between		Observed Horizontal Angles. ° ′ ″	No. of Measures.	No. of Partial Means.
Bokkeveld's Berg, heliostat	and Heerenlogement's B., h.	77· 2·14·81	160	80
„ „ „	and Referring niche......	43·14· 9·62	40	20
Kamies-Sector Berg, theod. (reduced to W.R.), hel.	and „ „	140·35·55·54	40	20
Kamies-Sector Berg, theod. (reduced to W.R.), hel.	and Bokkeveld's Berg, hel..	97·21·48·93	160	80
Referring niche.........	and Heerenlogement's B., h.	33·48· 4·80	80	40

The referring niche was a cleft in the Bokkeveld Berg, it was seldom well-defined.

The angles at this station were measured by Mr. Smyth in July, 1843.

39. Roodewal Bay Station.

Roodewal Bay Station.

About $4\frac{1}{2}$ miles north of the mouth of the Zout Riviere, and within three miles of the sea-shore, there is a conical-shaped mound of granite, naked at the top, which top is 621 feet above the sea level. Roodewal Bay is about nine or ten miles to the north; further to the north, the remarkable stone (Hondeklip) that gives the name to the small inlet, Hondeklip Bay, is visible.

The land all about is a sandy desert, in parts covered with stunted bush. A little brackish water can be obtained by digging in the sand near the beach, but in greater quantity about $4\frac{1}{2}$ miles to the north-west, where a small habitation has been built.

The station is upon the naked granite topping of the conical-shaped rise, and is marked, as usual, by a cylinder of lead inserted in the rock.

The Beaufort theodolite was centered over the angle point.

Names of Stations and Signals. Between		Observed Horizontal Angles. ° ′ ″	No. of Measures.	Weights.
Kamies-Sector Berg, hel.	and Louis Fontein, heliostat	64· 7·56·176	128	7·65
„ „ „ „	and „ „ „	64· 7·55·360	118	16·75
Louis Fontein, heliostat..	and Kamies-Sector B., hel.	295·52· 3·225	100	7·58
„ „ „	and „ „ „ „	295·52· 3·980	30	3·14
	(Mean =	64· 7·55·900		35·12)

§ 3. Roodewal Bay Station—(*continued*).

Louis Fontein, heliostat... and Vogel Klip, heliostat..	248·10·42·560	100	20·95
„ „ „ and „ „ „	248·10·42·795	100	2·72
„ „ „ and „ „ „	248·10·42·688	40	33·52
(Mean =	248·10·42·650		57·19)
Vogel Klip, heliostat..... and Kamies-Sector B., hel.	47·41·20·660	100	11·48
„ „ „ and „ „ „ „	47·41·22·565	100	28·65
„ „ „ and „ „ „ „	47·41·20·260	100	31·68
(Mean =	47·41·21·240		71·81)
Vogel Klip, heliostat..... and Ezel's Kop, heliostat..	46·39·28·235	100	8·53
„ „ „ and „ „ „	46·39·28·180	100	6·74
(Mean =	46·39·28·210		15·27)
Ezel's Kop, heliostat..... and Kamies-Sector B., hel.	1· 1·53·080	100	6·02
„ „ „ and „ „ „ „	1· 1·53·180	100	41·47
„ „ „ and „ „ „ „	1· 1·53·050	40	18·91
(Mean =	1· 1·53·130		66·40)
Ezel's Kop, heliostat..... and Louis Fontein, heliostat	65· 9·49·715	100	22·54
„ „ „ and „ „ „	65· 9·48·780	100	3·66
(Mean =	65· 9·49·580		26·20)

Very bad definition, and very bad signalling throughout the time (February 12 to March 4). One half of the measures were made with the axis reversed; also the telescope was moved alternately direct and backward, which amounts to the same as measuring the supplement of the angle, and the angle itself.

Dense thunder clouds often capped the stations.

By combining the angles in every possible way, we obtain the following:—

Ezel's Kop............. and Louis Fontein.......	65· 9·49·28	82·7
Kamies-Sector Berg..... and „ „	64· 7·56·08	95·9
Vogel Klip............ and Kamies-Sector Berg..	47·41·21·25	120·1
„ „ and Ezel's Kop..........	46·39·28·05	84·2
Ezel's Kop............. and Kamies-Sector Berg..	1· 1·53·20	102·7
Louis Fontein.......... and Vogel Klip..........	248·10·42·67	99·7

The angles at this station were measured by Mr. Maclear.

40. Ezel's Kop Station.

Ezel's Kop Station.

Ezel's Kop is one of the granite peaks of the Kamies Bergen, and the nearest to the south of the Lily Fontein Missionary Institution. It was occupied conventionally, being the only one which could be recognised from Vogel Klip, among the confusion of tops, while on the preliminary expedition in search of stations; and retained lest Kamies-Sector Berg should be masked from any of the Bushman Flat stations.

It is not essential to the arc of the meridian.

§ 3. Ezel's Kop Station–(*continued*).

The Beaufort theodolite was centered over the angle point.

NAMES OF STATIONS AND SIGNALS. BETWEEN		Observed Horizontal Angles. ° ′ ″	No. of Measures.	Weights.
Roodewal, heliostat......	and Vogel Klip, heliostat..	91·51·34·47	100	16·02
Vogel Klip, heliostat.....	and Louis Fontein, heliostat	203·48· 8·50	130	19·29
Louis Fontein, heliostat...	and Roodewal, heliostat...	64·20·17·32	100	24·58
Vogel Klip, heliostat.....	and Referring niche......	190·16·50·57	100	24·78
Referring niche.........	and Vogel Klip, heliostat..	169·43· 9·75	20	

At first, the Louis Fontein and Roodewal stations were frequently fog bound, which led to the employment of the referring niche,—afterwards the weather improved.

The angles at this station were measured by Mr. Maclear, between the 23rd and 30th of March, 1847.

41. Kamies-Sector Berg Station.

Kamies-Sector Berg Station.

This station has been described at page 407.

On detecting the outline of Louis Fontein Berg, through a gap in the "Welcome Curtain," the signalman who was left to flash an heliostat light along its top, inadvertently took up a position which is masked from Bokkeveld's Berg by the south-east group of rocks, and from Roodewal Bay by the opposite one. From this position he directed a steady light on being answered from Louis Fontein, which Mr. Smyth, who was on the look-out there, connected with the Bokkeveld station. The point thus inadvertently taken up is termed the "theodolite" station in the field-books, but more correctly since, the "azimuth point;" the operations performed there were as follows:

Dollond's repeating theodolite having been centered over the point, and made to bisect a meridian mark, viz.: a disc 14 inches in diameter, painted on the nearly vertical face of a rock to the south, in the "Welcome" range, distant about seven miles; the 30-inch transit instrument, resting upon a block of granite of about two tons weight, was placed 26 feet 3 inches south of the repeating instrument, and by means of the latter as a collimator, the optical axis was brought to coincide with the line joining the "azimuth point" and meridian disc.

The transit instrument served for determining the error in azimuth of the disc by astronomical observation.

The angle between the disc and the Louis Fontein station point was measured afterwards with the Fuller theodolite, and found to be $10^{\circ}\cdot34'\cdot44''\cdot96$; and between the disc and the "west rock" station point (to be mentioned presently) $306^{\circ}\cdot54'\cdot32''$, reckoning *from* that station in the order of increasing readings through north, east, to south. No other angles were measured at "point azimuth," nor light reflected from it, except to Louis Fontein and Eland's Hoogte, and if the light had been given from the "west rock" angle

point, the angles at Louis Fontein would have been greater by $2'\,19''.44$ and $2'\,17''.42$ respectively. A square building of dry stone, 12 × 12 feet inside area, the walls 3 feet thick and 8 feet high, was erected (but not roofed), wherein pendulum experiments were intended to be made: "azimuth point" is in the middle of the floor of this building, marked by a cylinder of lead let into the rock, with a brass pin inserted in its center. § 3. Kamies-Sector Berg Station—(*continued*).

The second station is that of the zenith sector, the spindle of which was 21 feet 3 inches west of "azimuth point," and 5½ inches more southerly.

The third is the "west rock," or real theodolite station. This rock is the southernmost and the larger of two huge granite blocks, resting near together,—the chief of the group that interrupted the line of sight between "azimuth point" and Roodewal Bay. The angle point, marked as usual, is in the middle, at the bottom of a natural channel which runs across the rock, and is distant 210 feet from "azimuth point,"—and the angular distance between the latter and Bokkeveld's Berg station, viz.: the angle of direction (γ) is $74^\circ\,38'\,40''$.

The Fuller and the Beaufort theodolites were consecutively centered over the "west rock" point, and the heliostat lights to the several distant stations (with the exceptions before specified) were shewn from it; it should, therefore, be regarded as the Kamies-Sector Berg trigonometric or angle point, although for a particular purpose it may be necessary to refer the angles to "azimuth point." The following table exhibits the calculation of the reductions:—

Calculation of the reductions from the "West Rock" angle point to "Azimuth point."
(21 feet 3 inches east, and 5½ inches north of the Zenith Sector spindle).

$$r = 210 \text{ feet. } \log. \frac{r}{\text{sine } 1''} = \log. r'' = 7{\cdot}6366444.$$

(γ), the angle of direction is reckoned from "azimuth point" towards the right.

STATIONS.	γ	Log. r'' sine γ.	Log. Distance.	Log. Reduction.	Reduction.
	° ′ ″				″
Boschluis...........	0·18·55	5·3772129	5·4763866	9·9008263	+ 0·796
Keibiskow..........	51· 6·39	7·5278260	5·6231340	1·9046920	+ 80·296
Bokkeveld's Berg...	74·38·40	7·6208571	5·5861267	2·0347304	+108·325
Eland's Hoogte.....	106·10·27	7·6191053	5·4810443	2·1380610	+137·424
Meridian Disc......	116· 4·14	7·5900433			
Louis Fontein	126·52·32	7·5397022	5·3953179	2·1443843	+139·439
Roodewal	187·45·29	6·7669468	5·3546493	1·4122975	− 25·840
Vogel Klip.........	273·41·10	7·6357450	5·3634221	2·2723229	−187·208
Koe Berg.....	321·57·20	7·4264172	5·4000914	2·0263258	−106·249
North Sector Station, Bushman Flat....	327·10· 4	7·3707886	5·4170639	1·9537247	− 89·893

The total reduction for any angle is found by subtracting, algebraically, the reduction for the left hand station from the reduction for the right hand station. The angle of direction (γ) for the left hand station is always less than for the right.

§ 3. Kamies-Sector Berg Station—(*continued.*)

The following table exhibits the observed angles at the West Rock station, and the same reduced to the Azimuth point: also the two angles observed at the latter:—

NAMES OF SIGNALS AND STATIONS.		Fuller or Beaufort Theodolite.	Horizontal Angles observed at the West Rock Station.	Reduction to Point Azimuth.	Horizontal Angles observed at, or reduced to, Point Azimuth.	No. of Observations.	Weights and Partial Means.
BETWEEN			° ′ ″		° ′ ″		
Keibiskow, heliostat........	and Bokkeveld's Berg, hel.	B	23·32· 1·98	+ 28·03	23·32·30·01	260	131·99
Bokkeveld's Berg, heliost.	and Louis Fontein, heliost.	F	52·13·51·85	+ 31·11	52·14·22·96	160	80·00
" " "	and Eland's Hoogte, hel....	F	31·31·47·12	+ 29·10	31·32·16·22	140	70·00
" " "	and Meridian disc...........	F	41·25·31·18			160	80·00
Eland's Hoogte, heliostat.	and " "	F	9·53·45·18			160	80·00
Louis Fontein, heliostat..	and Roodewal, heliostat....	B	60·52·57·67	−165·28	60·50·12·39	400	120·13
Roodewal, heliostat.........	and Vogel Klip, heliostat..	B	85·55·40·91	−161·37	85·52·59·54	312	189·32
Vogel Klip, heliostat.......	and Koe Berg, heliostat....	B	48·16·11·61	+ 80·96	48·17·32·57	150	16·20
* " " "	and North End, heliostat...	B	53·28·54·50	+ 97·32	53·30·31·82	600	102·42
" " "	and Louis Fontein, heliost.	B	213·11·21·42	+326·65	213·16·48·07	200	30·96
Koe Berg, heliostat.........	and Boschluis, heliostat....	B	38·21·37·52	+107·05	38·23·24·57	100	15·36
Boschluis, heliostat.........	and Keibiskow, heliostat...	B	50·47·44·32	+ 79·50	50·49· 3·82	378	49·29
Ezel's Kop, heliostat.......	and Institution Berg, pile..	B	50· 7· 4·90			5	
Institution Berg, pile......	and Vogel Klip, heliostat..	B	25· 7· 1·40			5	
Azimuth point..............	and Meridian disc...........	F	116· 4·13·87			8	4·00
" "	and Bokkeveld's Berg, hel.	F	74·38·39·63			8	4·00
West Rock Station.........	and Louis Fontein, heliost.	F			306·54·39·20	4	2·00
Meridian disc.................	and " " "	F			10·34·44·96	160	80·00

The observations at this station were made by the following persons: those with the Fuller theodolite by Mr. Smyth. The greater part of those with the Beaufort theodolite by Mr. Maclear, the remainder by Mr. Montagu. The observations for latitude, with Bradley's seetor, by Mr. Maclear. The observations for azimuth by Mr. Maclear.

42. Keibiskow Station.

Keibiskow Station.

Keibiskow is the remarkable conical-shaped high mountain, which is conspicuous for a long distance from all directions on the north-west frontier. It is nearly 80 miles south-eastward from the Kamies-Sector Berg, and the only elevation, within that distance, that commands a view of the Bushman Flat to the north, and of the Bokkeveld's Berg to the southward,—strictly speaking, it commands only the eastern part of the flat.

"The station point is covered by a four feet pile, which is surrounded by a stone house, five feet six inches in height. Leaden plugs, each carrying a brass pin, and secured by a small pile, are laid down for the direction of Kamies Berg, Boschluis, and Bokkeveld's Berg. The position of the station would not allow of a plug being fixed for Klip Rug."

* The north station is the theodolite point in the Bushman Flat, close to the Zenith Sector station there.

The Fuller theodolite was centered over the station point.

§ 3. Keibiskow Station—(*continued*).

NAMES OF STATIONS AND SIGNALS.		Observed Horizontal Angles.	No. of Measures	No. of Partial Means.
BETWEEN		° ′ ″		
Bokkeveld's Berg, heliostat	and Kamies-Sector B., hel.	66·39·14·81	158	62
Kamies-Sector Berg, hel..	and Boschluis, heliostat...	45·12·25·49	68	34
Boschluis, heliostat......	and Bokkeveld's Berg, hel.	248· 8·16·98	100	50
Klip Rug, heliostat......	and ,, ,, ,,	48·46·11·18	86	40
,, ,, kop..........	and ,, ,, ,,	50·16·10·05	20	10
Hantam Berg..........	and Klip Rug...........	44· 0·58·60	1	
Spion Berg............	and ,, ,,	64·21· 7·90	1	

The observations at this station were made by Messrs. Campion and Montagu, between December 15, 1846, and January 26, 1847.

43. Vogel Klip Station.

Vogel Klip Station.

Vogel Klip is one of the granite elevations of the range, extending north-westward from the Kamies Berg, situated in the neighbourhood of the most valuable of the copper mines. The Roodewal station is visible through a narrow cleft, or kloof, in the mountains, about 10 miles to south; in the opposite direction, mountains prevent a view of the Bushman Flat further to the north than the line to Koe Berg prolonged.

The top is naked granite, and the point is masked, as usual, by a cylinder of lead and brass pin; also "leaden plugs, each carrying a brass pin and covered with piles six feet in height, are laid down for the direction of all the stations observed from the point, viz.: Koe Berg, North End, Kamies-Sector Berg, and Roodewal. After the measurement of the angles, a stone pile, 15 feet in height, twelve feet at the Base and three and a half at the top, was erected over the station point."

The Fuller theodolite was centered over the station point.

NAMES OF STATIONS AND SIGNALS.		Observed Horizontal Angles.	No. of Measures.	No. of Partial Means.
BETWEEN		° ′ ″		
North End Station, helios.	and Kamies-Sector B., hel.	70·14·25·17	120	60
,, ,, ,, ,,	and Ezel's Kop, pile......	75· 8·25·87	20	10
Ezel's Kop, pile.........	and Roodewal, heliostat...	41·29· 8·36	20	10
Kamies-Sector Berg, hel...	and ,, ,,	46·23· 9·92	80	40
,, ,, ,, ,,	and Ezel's Kop, pile......	4·54· 3·62	30	15
Koe Berg, heliostat......	and Kamies-Sector B., hel.	71·17· 6·58	80	40
,, ,, ,,	and North End Station, hel.	1· 2·40·95	120	60
,, ,, ,,	and Ezel's Kop, pile......	76·11· 7·32	20	10
Roodewal, heliostat......	and North End Station, hel.	243·22·25·32	120	60

44. Boschluis Station, Bushman Flat.

§ 3. Boschluis Station, Bushman Flat.

The position of this station is on the most westerly part of the Bushman Flat, from whence the top of Keibiskow is visible above the horizon, during the hours of maximum refraction. It is upon a gentle swell, about 12 miles distant from an extensive salt pan, or rather series of salt pans, which are fed by a fountain of brackish water that issues from the ground, and bears the name, in Dutch, of a disagreeable insect.

The soil at the station is deep brown sand, covered with tufts of "Bushman grass," which is said to grow luxuriantly after thunder showers. Making due allowance for this relief to the eye, it is difficult to conceive anything more dreary or depressing to the spirits than the monotonous aspect of this desert flat,—without water, shelter, or resource of any description.

The station was occupied from the 5th to the 12th of January, 1847, with the Beaufort theodolite, and from the 26th to the 29th of June, with the Fuller theodolite. During the former, the thermometer sheltered from the sun by a wagon, was rarely below 100° in the middle of the day, sometimes 105°.

The station point is marked by a wooden picket, carrying a brass pin, which was left covered with a mound of sand.

Names of Stations and Signals. between		Beaufort or Fuller Theodolite.	Observed Horizontal Angles.	No. of Measures.	Weights.
Keibiskow, heliostat....	and Kamies-Sector B., hel.	B	84° 0′ 12″·94	200	59·4
Kamies-Sector Berg, hel.	and Koe Berg, heliostat..	F	56·40·51·88	60	30·0
Koe Berg, heliostat.....	and Kamies-Sector B., hel.	F	303·19·10·48	20	10·0

The measures with the Beaufort theodolite by Mr. Maclear, those with the Fuller theodolite by Mr. Campion.

45. Koe Berg Station, Bushman Flat.

Koe Berg Station, Bushman Flat.

The station is on a low mountain, apparently composed of quartz,—the middle and the highest of an irregular group, situated in a gentle depression of the flat, and distant north-easterly about 25 miles from Riet Fontein. It was taken up from necessity, in order to connect Boschluis with the north station.

The Beaufort theodolite was centered over the station point.

Names of Stations and Signals. between		Observed Horizontal Angles.	No. of Measures.	Weights.
Kamies-Sector Berg, hel...	and Vogel Klip, heliostat..	60° 26′ 55″·66	200	75·26
Vogel Klip, heliostat.....	and Kamies-Sector B., hel.	299·33· 4·63	200	40·29
Kamies-Sector Berg, hel...	and Vogel Klip, heliostat..	60·26·58·38	56	5·62
,, ,, ,, ,,	and Ezel's Kop, pile......	3·38·22·55	20	

Ezel's Kop, pile.........	and Vogel Klip, heliostat..	56·48·34·45	10		§ 3. Koe Berg Station, Bushman Flat—(continued).
Vogel Klip, heliostat......	and North End, pole.....	189·14·54·83	40	26·41	
*North End, pole........	and Boschluis, heliostat...	25·20·23·62	30	6·08	
*Boschluis, heliostat......	and Kamies-Sector B., hel.	84·57·46·23	50	50·85	
North end of a small Base	and South end of small Base	36·20·31·20	10		
South do. do.	and Kamies-Sector B., hel.	82·37·43·45	10		

The above angles were measured by Mr. Maclear, excepting the two marked with an asterisk, which were measured by Mr. Montagu.

46. North End Station, Bushman Flat.

This station is the north termination of the Arc: it is on a gentle swell of the Flat, distant about 4·8 miles *east* of Koe Berg. The angle at Koe Berg, between it and Kamies-Sector Berg, "West Rock" *station*, is $110^{\circ} \cdot 18' \cdot 9'' \cdot 9$; the angle at the *north end*, between Kamies-Sector Berg, "West Rock" station, and Koe Berg, is $64^{\circ} \cdot 29' \cdot 12''$. North End Station, Bushman Flat.

The soil is loose limestone covered with sand, resting on granite,—the common base of this extensive plain.

As there was no bush to be had for constructing a ring fence round the sector-tent, a circular pit, 30 feet in diameter, was cut through the limestone to the depth of about six feet, into which the lower part of the tent tripod was sunk, and there firmly jammed. The distance between the spindle (vertical axis) of the sector and the theodolite point was 35 feet 4 inches, the former east of, and on the parallel of the latter.

The Beaufort theodolite was centered over the angle point.

NAMES OF STATIONS AND SIGNALS.	BETWEEN	Observed Horizontal Angles. ° ′ ″	No. of Measures.	Weights.
Kamies-Sector B., W.R., h.	and Vogel Klip, heliostat..	56·16·53·40	500	223·83
Vogel Klip, heliostat.....	and Kamies-Sec. B., W.R., h.	303·43· 6·60	500	371·49
Kamies-Sector B., W.R., h.	and Ezel's Kop, pile......	3·15·53·88	50	8·39
Ezel's Kop, pile.........	and Vogel Klip, pile......	53· 0·59·32	70	14·69
Vogel Klip, heliostat.....	and Koe Berg, pole......	8·12·18·58	60	109·20

Of the operations at this station: the above angles were measured by Mr. Maclear, Mr. Montagu made a few observations for azimuth, with the 30-inch transit instrument.

A large portion of the observations for latitude, with Bradley's sector, were made by Mr. Maclear and Mr. Montagu conjointly, the remainder were made by Mr. Montagu alone.

ABSTRACT

OF THE

HORIZONTAL ANGLES OBSERVED

AT

THE SEVERAL STATIONS,

CORRECTED (WHERE NECESSARY) SO AS TO SATISFY THE RELATIONS SUBSISTING AMONG THE INDEPENDENT MEASURES.

NOTE.—The Angles which are numbered are those actually employed in the formation of the equations of condition. The numeration commences at the Base-line.

	STATION.	No. of Station.	No. of the Angle.	OBSERVED STATION POINTS.		ANGLES	Weight divided by 10.
						° ′ ″	
§ 4. West end of Base.	West end of Base.	21	1	East end.............	and Kapoc Berg..........	101·28·48·55	4·2
			2	,, ,,	and K. F. Contre Berg....	77·32·12·82	5·3
				For other Angles measured at this Station, see page 451.			
East end of Base.	East end of Base.	20	3	Kapoc Berg..........	and West end............	44·53·24·99	4·0
			4	Drie Fontein..........	and K. F. Contre Berg....	63· 7·21·43	3·4
			5	Riebeek's Kasteel.....	and Kapoc Berg	93·29·48·40	3·9
			6	West end............	and K. F. Contre Berg....	62·58·29·91	2·8
			7	Zwart Berg..........	and Drie Fontein.........	86·35·55·16	4·4
			8	,, ,,	and Riebeek's Kasteel.....	74·18·35·66	3·0
				For other Angles measured at this Station, see page 451.			
Kapoc Berg.	Kapoc Berg.	19	9	East end.............	and Riebeek's Kasteel.....	52·39·15·42	4·9
			10	Kapitein's Kloof......	and Winter Berg.........	51·59·52·57	10·1
			11	Patrys Berg..........	and Zwart Berg..........	60·10·16·09	8·1
			12	,, ,,	and Kapitein's Kloof......	38·55·59·05	1·1
			13	Piket Berg...........	and Riebeek's Kasteel.....	69·21·31·06	4·1
			14	Riebeek's Kasteel.....	and Simon's Berg.........	57· 3·45·96	1·74
			15	,, ,,	and King's Battery........	95·53·41·99	6·8
			16	,, ,,	and Royal Observatory....	93·20·23·15	5·9
			17	,, ,,	and Rogge Bay..........	98·13·19·23	4·3
			18	Sneeuw Kop.........	and King's Battery.......	33·30·39·75	4·7
			19	,, ,,	and Royal Observatory....	30·57·20·91	4·2
			20	West end...........	and East end............	33·37·47·12	5·8
			21	Winter Berg.........	and Sneeuw Kop.........	77·53·57·41	7·5
			22	Zwart Berg..........	and Riebeek's Kasteel.....	46·16·30·70	6·0
				Patrys Berg..........	and Piket Berg..........	37· 5·15·73	3·2
				King's Battery.......	and Table Mountain	2·20·59·54	3·3
				Winter Berg.........	and Riebeek's Kasteel.....	15·30·55·17	3·9
				Riebeek's Kasteel.....	and Table Mountain.......	98·14·41·53	1·3
				,, ,,	and Sneeuw Kop.........	62·23· 2·24	3·2
				Simon's Berg.........	and La Caille's Observatory	41·11·35·39	1·4
				,, ,,	and Royal Observatory....	36·16·37·19	1·5
				Royal Observatory....	and Table Mountain.......	4·54·18·38	4·4
				,, ,,	and Winter Berg.........	251· 8·41·68	5·9
				Table Mountain	and La Caille's Observatory	0· 0·39·82	2·9
				Bradley's Sector......	and Riebeek's Kasteel.....	73·50·56·78	5·9
				La Caille's Granary...	and ,, ,,	73·53·13·19	3·5
				,, ,, ,,	and Bradley's Sector......	0· 2·16·41	3·7
				For other Angles measured at this Station, see page 449.			
Klip Fontein, Contre Berg.	Klip Fontein, Contre Berg.	22	23	East end.............	and Drie Fontein.........	66·11· 0·07	4·4
			24	West end............	and East end............	39·29·18·20	4·6
				For other Angles measured at this Station see page 451.			

STATION.	No. of Station.	No. of the Angle.	OBSERVED STATION POINTS.	ANGLES.	Weight divided by 10.	
				° ′ ″		
Drie Fontein.	24	25	East end............ and Zwart Berg..........	48·43·36·35	3·5	§ 4. Drie Fontein.
		26	K. F. Contre Berg.... and East end............	50·41·39·63	3·6	
Riebeek's Kasteel.	23	27	Kapoc Berg.......... and East end............	33·50·58·30	7·9	Riebeek's Kasteel.
		28	,, ,, and Piket Berg..........	80·32·39·36	2·7	
		29	East end............ and Zwart Berg..........	43· 2·26·42	7·5	
		30	King's Battery....... and Kapoc Berg.........	51· 8· 7·28	4·8	
		31	Royal Observatory.... and ,, ,,	52· 9·37·84	4·8	
		32	Rogge Bay.......... and ,, ,,	48·13·12·81	4·6	
		33	Simon's Berg......... and ,, ,,	85·50·32·38	3·6	
			Kapoc Berg.......... and Zwart Berg..........	76·53·24·72	7·7	
			,, ,, and Bradley's Sector Station	76· 6·18·13	4·1	
			,, ,, and La Caille's Granary....	76· 5·39·47	3·25	
			La Caille's Granary... and Bradley's Sector Station	0· 0·38·66	2·3	
			For other Angles measured at this Station, see page 453.			
Zwart Berg.	25	34	Kapoc Berg.......... and Patrys Berg..........	78·49· 2·39	3·8	Zwart Berg.
		35	Drie Fontein......... and East end............	44·40·29·04	3·2	
		36	Patrys Berg.......... and Piket Berg..........	51· 8· 7·38	3·6	
		37	Riebeek's Kasteel..... and Kapoc Berg..........	56·50· 8·85	5·7	
		38	,, ,, and East end............	62·38·59·93	4·6	
			For other Angles measured at this Station, see page 454.			
Patrys Berg.	30	39	Eland's Berg......... and Piket Berg..........	44·48·35·40	4·0	Patrys Berg.
		40	Piket Berg........... and Zwart Berg..........	40·49·18·04	3·6	
		41	Zwart Berg.......... and Kapoc Berg..........	41· 0·47·77	7·9	
		42	Kapitein's Kloof...... and ,, ,,	78·40·51·71	5·1	
			For other Angles measured at this Station, see page 459.			
Piket Berg.	27	43	Kapoc Berg.......... and Patrys Berg..........	61· 4·47·83	14·0	Piket Berg.
		44	Patrys Berg.......... and Eland's Berg..........	83·57·35·08	13·0	
		45	Eland's Berg......... and Lambert's Hoek Berg..	52·20·33·03	12·6	
		46	Heerenlogement's Berg and Ceder Berg..........	55· 1· 4·58	7·5	
		47	Eland's Berg......... and Heerenlogement's Berg	26·57·13·26	5·0	
		48	Riebeek's Kasteel..... and Kapoc Berg..........	30· 5·58·55	3·9	
		49	Zwart Berg.......... and Patrys Berg..........	88· 2·38·53	6·1	
			Kapoc Berg.......... and Eland's Berg.........	145· 2·22·91	7·0	
			Eland's Berg......... and Ceder Berg..........	81·58·17·84	7·6	
			Lambert's Hoek Berg.. and Ceder Berg..........	29·37·44·81	5·9	
			,, ,, ,, and Kapoc Berg..........	162·37· 4·06		
			Ceder Berg.......... and Zwart Berg..........	106· 1·28·55		
			,, ,, and Kapoc Berg..........	132·59·19·25		

	STATION.	No. of Station.	No. of the Angle.	OBSERVED STATION POINTS.		ANGLES.	Weight divided by 10.
	The following Angles were omitted at page 457 for the reasons there assigned; but they are introduced here, as they enter into the combinations from which the preceding are deduced.						
						° ′ ″	
§ 4. Piket Berg—(continued).	Piket Berg—(continued).	27		Eland's Berg.........	and Tafel Berg...........	135·30·48·28	4·0
				Lambert's Hoek Berg..	and " "	83·10·15·70	6·0
				" " "	and Western Point........	95·12· 1·32	6·0
				Ceder Berg..........	and Tafel Berg...........	53·32·31·15	6·0
				" "	and Western Point........	65·34·16·97	4·0
				Tafel Berg...........	and Kapoc Berg..........	79·26·47·79	6·0
				" "	and Patrys Berg..........	140·31·35·43	2·0
				Western Point........	and " "	128·29·49·21	2·0
				" "	and Kapoc Berg..........	67·25· 2·74	6·0
				" "	and Riebeek's Kasteel.....	37·19· 3·45	2·0
				For other Angles measured at this Station, see page 457.			
Kapitein's Kloof.	Kapitein's Kloof.	28	50	Kapoc Berg..........	and Patrys Berg..........	62·23·20·32	9·5
			51	Ceder Berg..........	and Winter Berg.........	74·43· 2·58	9·5
			52	Heerenlogement's Berg.	and Ceder Berg..........	54· 2·22·86	9·5
			53	Winter Berg.........	and Kapoc Berg..........	62·40·54·74	4·75
				" "	and Riebeek's Kasteel.....	31·45·16·27	9·5
				Riebeek's Kasteel.....	and Kapoc Berg..........	30·55·38·47	9·5
				Patrys Berg..........	and Heerenlogement's Berg.	106·10·19·50	7·6
				For other Angles measured at this Station, see page 457.			
Eland's Berg.	Eland's Berg.	31	54	Ceder Berg..........	and Piket Berg...........	62·43·30·27	11·1
			55	Heerenlogement's Berg.	and Lambert's Hoek Berg..	58·41·16·52	9·3
			56	" "	and Ceder Berg..........	63·43·19·48	10·5
			57	Piket Berg...........	and Patrys Berg..........	51·13·56·10	5·8
				Lambert's Hoek Berg..	and Piket Berg...........	67·45·33·23	8·6
				For other Angles measured at this Station, see page 460.			
Lambert's Hoek Berg.	Lambert's Hoek Berg.	32	58	Eland's Berg.........	and Heerenlogement's Berg.	65·47· 8·45	10·5
			59	Piket Berg...........	and Eland's Berg.........	59·53·53·79	8·2
				For other Angles measured at this Station, see page 460.			
Ceder Berg.	Ceder Berg.	33	60	Kapitein's Kloof......	and Heerenlogement's Berg.	73·31·44·97	5·8
			61	Piket Berg...........	and Eland's Berg.........	35·18·16·07	4·3
			62	" "	and Heerenlogement's Berg.	70·57·46·03	3·4
			63	Winter Berg.........	and Kapitein's Kloof......	53· 2·11·23	7·25
				Klip Rug............	and Winter Berg.........	166·42·35·38	4·7
				Eland's Berg.........	and Heerenlogement's Berg.	35·39·29·96	8·8
				Heerenlogement's Berg.	and Klip Rug............	66·43·28·42	6·4
				For other Angles measured at this Station, see page 461.			

STATION.	No. of Station.	No. of the Angle.	OBSERVED STATION POINTS.	ANGLES.	Weight divided by 10.	
				° ′ ″		
Heerenlogement's Berg.	34	64	Ceder Berg.......... and Eland's Berg.........	80·37·17·26	9·3	§ 4. Heerenlogement's Berg.
		65	„ „ and Kapitein's Kloof......	52·26· 6·12	4·0	
		66	„ „ and Piket Berg...........	54· 1·20·07	3·0	
		67	Eland's Hoogte....... and Bokkeveld's Berg.....	37·51·30·32	5·0	
		68	Louis Fontein........ and „ „	49·50·58·75	7·1	
		69	Lambert's Hoek Berg.. and Eland's Berg.........	55·31·38·25	5·0	
			Eland's Berg......... and Louis Fontein........	123·34·58·55	5 5	
			Bokkeveld's Berg..... and Klip Rug............	41·56·14·81	7·0	
			Klip Rug............ and Ceder Berg..........	64· 0·30·63	7·0	
			For other Angles measured at this Station, see page 463.			
Bokkeveld's Berg.	36	70	Heerenlogement's Berg. and Louis Fontein........	76· 9·45·54	10·0	Bokkeveld's Berg.
		71	„ „ and Eland's Hoogte.......	65· 6·28·41	10·0	
		72	Louis Fontein........ and Kamies Berg.........	40· 3·24·30	10·7	
		73	Kamies-Sector Berg... and Keibiskow...........	89·48·56·78	13·4	
			Louis Fontein........ and Kamies-Sector Berg...	40· 3·24·30	10·7	
			Klip Rug............ and Heerenlogement's Berg.	57·53·47·19	10·0	
			Eland's Hoogte....... and Kamies-Sector Berg...	51· 6·41·43	10·7	
			Keibiskow............ and Klip Rug............	96· 4. 6 19	6·6	
			For other Angles measured at this Station, see page 464.			
Klip Rug.	35		Ceder Berg.......... and Heerenlogement's Berg.	49·16·13·36	10·0	Klip Rug.
			Heerenlogement's Berg. and Bokkeveld's Berg.....	80·10·11·32	10·0	
			For other Angles measured at this Station, see page 464.			
Eland's Hoogte.	38	74	Bokkeveld's Berg..... and Heerenlogement's Berg.	77· 2·14·75	9·3	Eland's Hoogte.
		75	Kamies-Sector Berg... and Bokkeveld's Berg.....	97·21·48·60	9·0	
			For other Angles measured at this Station, see page 466.			
Louis Fontein.	37	76	Bokkeveld's Berg..... and Heerenlogement's Berg.	53·59·39·22	12·0	Louis Fontein.
		77	Kamies-Sector Berg... and Bokkeveld's Berg.....	87·43· 1·61	12·0	
		78	Roode Wal.......... and Ezel's Kop...........	50·30· 1·76	7·2	
		79	„ „ and Kamies-Sector Berg...	54·59·16·63	14·2	
			Ezel's Kop.......... and „ „ „	4·29·14·87	9·6	
			For other Angles measured at this Station, see page 465.			
Keibiskow.	42	80	Bokkeveld's Berg..... and Kamies-Sector Berg...	66·39·15·48	8·2	Keibiskow.
		81	Kamies-Sector Berg... and Boschluis	45·12·26·71	6·2	
			Boschluis .... and Bokkeveld's Berg.... Supplementary Angle............	248· 8·17·81	7·2	
			Klip Rug............ and Bokkeveld's Berg.....	48·46·11·18	4·0	
			For other Angles measured at this Station, see page 471.			

	STATION.	No. of Station.	No. of the Angle.	OBSERVED STATION POINTS.		ANGLES.	Weight divided by 10.
						° ′ ″	
§ 4. Roode Wal.	Roode Wal.	39	82	Kamies-Sector Berg	and Louis Fontein	64· 7·56·08	9·6
			83	Vogel Klip	and Ezel's Kop	46·39·28·05	8·4
			84	,, ,,	and Kamies-Sector Berg	47·41·21·25	12·0
				Ezel's Kop	and Louis Fontein	65· 9·49·28	8·3
				,, ,,	and Kamies-Sector Berg	1· 1·53·20	10·3
				Louis Fontein	and Vogel Klip, Supplementary Angle	248·10·42·67	10·0
Ezel's Kop.	Ezel's Kop.	40	85	Louis Fontein	and Roode Wal	64·20·17·25	3·34
			86	Roode Wal	and Vogel Klip	91·51·34·35	2·68
				Vogel Klip	and Louis Fontein, Supplementary Angle	203·48· 8·40	2·9
				For other Angles measured at this Station, see page 468.			
Vogel Klip.	Vogel Klip.	43	87	Ezel's Kop	and Roode Wal	41·29· 7·83	2·2
			88	Kamies-Sector Berg	and ,, ,,	46·23· 9·82	4·8
			89	Koe Berg	and Kamies-Sector Berg	71·17· 6·15	7·7
			90	North end Station	and ,, ,, ,,	70·14·25·00	9·1
				,, ,, ,,	and Ezel's Kop	75· 8·27·00	3·6
				Kamies-Sector Berg	and ,, ,,	4·54· 1·99	4·0
				Koe Berg	and North end Station	1· 2·41·15	8·9
				,, ,,	and Ezel's Kop	76·11· 8·15	3·4
				Roode Wal	and North end Station, Supplementary Angle	243·22·25·17	6·0
Kamies-Sector Berg.	Kamies-Sector Berg.	41	91	Bokkeveld's Berg	and Eland's Hoogte	31·31·46·71	11·0
			92	,, ,,	and Louis Fontein	52·13·51·45	8·0
			93	Boschluis	and Keibiskow	50·47·43·66	4·93
			94	Koe Berg	and Boschluis	38·21·35·41	1·54
			95	Keibiskow	and Bokkeveld's Berg	23·32· 1·73	13·2
			96	Louis Fontein	and Roode Wal	60·52·57·40	12·0
			97	Roode Wal	and Vogel Klip	85·55·40·74	18·9
			98	Vogel Klip	and North end Station	53·28·54·50	10·24
			99	,, ,,	and Koe Berg	48·16· 9·61	1·62
				Bokkeveld's Berg	and Meridian Mark	41·25·31·53	11·7
				Eland's Hoogte	and ,, ,,	9·53·44·82	11·7
				For other Angles measured at this Station, see page 470.			
Koe Berg.	Koe Berg.	45	100	Boschluis	and Kamies-Sector Berg	84·57·46·23	5·09
			101	Kamies-Sector Berg	and Vogel Klip	60·26·55·56	11·56
			102	North end Station	and ,, ,,	170·45· 5·17	2·64
				For other Angles measured at this Station see page 472.			

STATION.	No. of Station.	No. of the Angle.	OBSERVED STATION POINTS.		ANGLES.	Weight divided by 10.	
					° ′ ″		
North end Station.	46	103	Kamies Berg.........	and Vogel Klip...........	56·16·53·40	59·5	§ 4. North end Station.
		104	Vogel Klip...........	and Koe Berg............	8·12·18·58	10·92	
			For other Angles measured at this Station, see page 473.				
Boschluis.	44	105	Kamies-Sector Berg...	and Koe Berg...........	56·40·51·29	4·0	Boschluis.
		106	Keibiskow...........	and Kamies-Sector Berg...	84· 0·12·94	5·94	
			For other Angles measured at this Station, see page 472.				
Rogge Bay.	11	107	Kapoc Berg..........	and Riebeek's Kasteel.....	33·33·35·14	8·2	Rogge Bay.
		108	Riebeek's Kasteel.....	and Simon's Berg.........	50·58·58·02	2·25	
			Kapoc Berg..........	and Blaauw Berg.........	16·54·38·53	9·8	
			Blaauw Berg.........	and Riebeek's Kasteel.....	16·38·56·61	7·5	
			For other Angles measured at this Station, see page 437.				
Royal Observatory.	14	109	Blaauw Berg.........	and Sneeuw Kop.........	103·38·51·57	5·5	Royal Observatory.
		110	Kapoc Berg..........	and Riebeek's Kasteel.....	34·30· 6·59	12·7	
		111	,, ,,	and Simon's Berg.........	86·25·25·01	1·6	
		112	,, ,,	and Sneeuw Kop.........	111· 3· 1·66	5·3	
		113	Simon's Berg.........	and Zwart Berg..........	104·31·47·08	2·6	
		114	Sneeuw Kop.........	and ,, ,,	79·54·10·43	2·5	
			Blaauw Berg.........	and Simon's Berg.........	79· 1·14·92	2·0	
			For other Angles measured at this Station, see page 441.				
Blaauw Berg, Meridian Mark.	17	115	Sneeuw Kop.........	and King's Battery........	61·36·22·89	1·9	Blaauw Berg, Meridian Mark.
		116	,, ,,	and Cape Point	54·33·53·43	5·2	
		117	,, ,,	and Royal Observatory....	55·28·34·51	4·5	
		118	,, ,,	and Zwart Kop...........	57·38·15·53	1·54	
			Cape Point	and Royal Observatory....	0·54·41·08	7·4	
			Royal Observatory....	and King's Battery.......	6· 7·48·38	1·7	
			For other Angles measured at this Station, see page 444.				
Simon's Berg.	18	119	Cape Point	and King's Battery	41·40·49·30	10·4	Simon's Berg.
		120	Kapoc Berg..........	and Riebeek's Kasteel.....	37· 5·45·63	1·36	
		121	King's Battery.......	and Kapoc Berg..........	59· 0 2 68	0·75	
		122	Royal Observatory....	and ,, ,,	57·18· 3·07	1·37	
		123	Rogge Bay..........	and Riebeek's Kasteel.....	91·23·47·49	1·57	
		124	Zwart Kop...........	and King's Battery	31· 6·19·73	40·9	
		125	,, ,,	and Royal Observatory....	32·48·19·34	14·2	
			Royal Observatory....	and Riebeek's Kasteel.....	94·23·48·70	2·25	
			,, ,,	and Rogge Bay..........	3· 0· 1·21	1·27	
			,, ,,	and Tyger Berg..........	13·20· 8·23		
			King's Battery.......	and Royal Observatory....	1·41·59·61	7·5	
			Tyger Berg..........	and Riebeek's Kasteel.....	81· 3·40·47		
			Riebeek's Kasteel.....	and Cape Point	222·13·22·39	0·27	
			For other Angles measured at this Station, see page 446.				

	STATION.	No. of Station.	No. of the Angle.	OBSERVED STATION POINTS.	ANGLES	Weight divided by 10.
					° ′ ″	
§ 4. King's Battery.	King's Battery.	15	126	Kapoc Berg.......... and Riebeek's Kasteel.....	32·58·17·12	8·8
			127	„ „ and Simon's Berg.........	82·10·10·20	1·6
			128	„ „ and Sneeuw Kop.........	105·51·56·65	14·4
			129	Blaauw Berg......... and „ „	94·53·16·71	30·0
			130	Simon's Berg......... and Zwart Kop...........	101·53·15·53	4·03
			131	„ „ and Cape Point	98·11·10·78	3·9
			132	Sneeuw Kop......... and „ „	74·29·24·33	1·9
			133	„ „ and Zwart Kop...........	78·11·29·08	3·3
				„ „ and Kogel Berg..........	26·54·14·87	3·5
				Blaauw Berg......... and Simon's Berg.........	71·11·32·49	6·7
				„ „ and Zwart Kop...........	173· 4·48·02	6·4
				„ „ and Riebeek's Kasteel.....	21·59·37·18	7·6
				„ „ and Tyger Berg..........	43·45·41·11	0·4
				Kogel Berg.......... and Cape Point	47·35· 9·46	1·8
				„ „ and Zwart Kop...........	51·17·14·21	3·1
				Cape Point .... and „ „	3·42· 4·75	3·4
				Kapoc Berg.......... and Blaauw Berg.........	10·58·39·94	17·2
				Tyger Berg.......... and Sneeuw Kop.........	51· 7·35·60	0·4
				For other Angles measured at this Station, see page 442.		
Sneeuw Kop, H.H.	Sneeuw Kop, H.H.	6	134	Cape Point .... and King's Battery.......	48 22·40·77	16·9
			135	„ „ and Blaauw Berg.........	71·53· 6·36	2·9
			136	Kapoc Berg.......... and Winter Berg.........	46·56·49·07	10·5
			137	King's Battery........ and Kapoc Berg..........	40·37·30·22	14·2
			138	Royal Observatory.... and „ „	37 59·42·13	14·2
			139	„ „ and Blaauw Berg.........	20·52·37·50	3·5
			140	Zwart Kop.......... and King's Battery.......	34·16·13·77	12·0
			141	„ „ and Royal Observatory....	36·54· 1·86	12·0
				Cape Point........... and Rogge Bay..........	51·15·18·86	13·0
				„ „ and Royal Observatory....	51· 0·28·86	16·9
				„ „ and Table Mountain.......	45·55·29·66	13·0
				„ „ and Kapoc Berg..........	89· 0·10·99	19·8
				„ „ and Zwart Kop..........	14· 6·27·00	12·0
				„ „ and Tyger Berg..........	66·25·38·81	5·3
				Danger Point......... and Cape Point	82·43·45·27	11·9
				Kogel Berg.......... and „ „	29·50·41·18	6·3
				„ „ and Noah's Arc..........	47·50·21·70	4·0
				Noah's Arc.......... and Tyger Berg..........	48·25·58·29	3·0
				Rogge Bay .... and Kapoc Berg..........	37·44·52·13	13·0
				Zonder Einde Berg.... and Danger Point........	57·12·50·04	11·9
				„ „ „ and Kogel Berg..........	110· 5·54·13	6·1
				Winter Berg......... and Zonder Einde Berg....	84· 6·24·63	10·5
				Table Mountain ...... and Kapoc Berg..........	43· 4·41·33	13·0
				For other Angles measured at this Station, see page 431.		
Winter Berg.	Winter Berg.	29	142	Kapoc Berg.......... and Kapitein's Kloof......	65·19·23·84	10·7
			143	Kapitein's Kloof...... and Ceder Berg..........	52·15· 2·07	10·7
			144	Sneeuw Kop......... and Kapoc Berg..........	55· 9·32·39	10·7
				Ceder Berg.......... and Sneeuw Kop.........	187·16· 1·70	10·7
				For other Angles measured at this Station, see page 458.		

STATION.	No. of Station.	No. of the Angle.	OBSERVED STATION POINTS.	ANGLES.	Weight divided by 10.	
				° ′ ″		
Zwart Kop.	9	145	King's Battery........ and Simon's Berg.........	47· 0·29·13	5·5	§ 4. Zwart Kop.
		146	,, ,, and Sneeuw Kop.........	67·32·22·00	5·5	
		147	Blaauw Berg .... and ,, ,,	64·35·14·39	11·1	
		148	Royal Observatory.... and ,, ,,	63·11·52·22	6·8	
		149	,, ,, and Simon's Berg.........	42·39·59·35	3·0	
			King's Battery........ and Royal Observatory....	4·20·29·78	6·7	
			,, ,, and Blaauw Berg.........	2·57· 7·61	3·6	
			Royal Observatory.... and Kogel Berg..........	87·27·44·72	2·4	
			Sneeuw Kop......... and ,, ,,	24·15·52·50	2·0	
			Table Mountain....... and Sneeuw Kop.........	72·15·11·00	2·0	
			,, ,, and Kogel Berg..........	96·31· 3·50	1·0	
			For other Angles measured at this Station, see page 435.			
Cape Point.	8	150	Blaauw Berg......... and Sneeuw Kop.........	53·33· 9·38	10·0	Cape Point.
		151	King's Battery........ and Simon's Berg.........	40· 8· 5·82	4·5	
		152	,, ,, and Sneeuw Kop.........	57· 8· 0·04	4·9	
			For other Angles measured at this Station, see page 434.			
Kogel Berg.	7		Sneeuw Kop......... and Mudge Point.........	104·55·36·91	4·0	Kogel Berg.
			Mudge Point......... and Zwart Kop..........	143·17·23·25	4·0	
			Cape Point .... and ,, ,,	20·53·23·53	5·0	
			,, ,, and Table Mountain.......	54·36·30·42	5·1	
			,, ,, and King's Battery........	57·47·58·89	4·0	
			Zwart Kop.......... and Tyger Berg..........	55·50·35·90	5·0	
			,, ,, and Royal Observatory....	40·13·17·00	4·0	
			Table Mountain ...... and Sneeuw Kop.........	78· 3·52·95	5·0	
			King's Battery........ and ,, ,,	74·52·24·48	4·0	
			Royal Observatory.... and ,, ,,	71·33·42·84	4·0	
			Tyger Berg.......... and ,, ,,	55 56·23·94	5·0	
			For other Angles measured at this Station, see page 433.			
Zonder Einde Berg.	5		Cape L'Agulhas...... and Danger Point........	46· 8·41·22	7·2	Zonder Einde Berg.
			Danger Point .... and Sneeuw Kop.........	55·24·46·03	7·3	
			,, ,, and Babylon's Toren......	24· 5· 7·08	5·4	
			Babylon's Toren...... and Sneeuw Kop.........	31·19·38·95	4·2	
			Pot Berg............ and Cape L'Agulhas......	52·36·44·32	6·2	
			Sneeuw Kop......... and Pot Berg............	205·49·48·43	3·9	
			For other Angles measured at this Station, see page 430.			
Babylon's Toren.	4		Kogel Berg.......... and Sneeuw Kop.........	33· 7·51·00	1·9	Babylons's Toren.
			Sneeuw Kop......... and Zonder Einde Berg....	102·23·28·62	8·2	
			Zonder Einde Berg.... and Danger Point........	103·49·47·25	16·8	
			Danger Point........ and Mudge Point.........	73·23·41·81	0·6	
			Mudge Point......... and Kogel Berg..........	47·15·11·32	1·9	
			For other Angles measured at this Station, see page 429.			

§ 4. Tyger Berg.

STATION.	No. of Station.	No. of the Angle.	OBSERVED STATION POINTS.	ANGLES.	Weight divided by 10.
				° ′ ″	
Tyger Berg.	16		Sneeuw Kop......... and Cape Point..........	70·24·47·40	1·24
			" " and Naval Yard, clock tower	82·28·57·15	
			" " and Naval Yard Station....	82·31·50·20	32·4
			" " and Table Mountain.......	111·10·58·92	1·91
			" " and Zwart Kop...........	77·31·19·09	0·74
			" " and King's Battery........	110·49·26·73	1·87
			" " and Royal Observatory....	109·57·57·15	3 60
			Kogel Berg.......... and Cape Point..........	42·37·30·61	1·21
			" " and Zwart Kop...........	49·44· 2·30	159·0
			Zwart Kop........... and Table Mountain.......	33·39·39·83	0·57
			Naval Yard, clock tower and King's Battery........	28·20·29·58	
			Royal Observatory.... and Blaauw Berg.........	90· 7·21·06	2·03
			King's Battery........ and Robben Isld., ch. tower	53·49·21·09	
			" " and Blaauw Berg.........	89·15·51·48	2·38
			Table Mountain....... and Robben Isld., ch. tower	53·27·48·90	1·41
			Robben Isld., ch. tower and Blaauw Berg.........	35·26·30·39	20·3
			Blaauw Berg......... and Sneeuw Kop........ Supplementary Angle............	159·54·41·79	0·30
			For other Angles measured at this Station, see page 443.		

For La Caille's Observatory Station, see page 437.
For the Cape Town Parade Station, see page 439.
For the Klip Fontein Station, see page 454.
For the L'Agulhas Station, see page 427.
For the Danger Point Station, see page 427.
For the Mudge Point Station, see page 428.
For the Naval Yard Station, see page 436.

INVESTIGATION OF THE CORRECTIONS

TO BE

APPLIED TO THE NUMBERED ANGLES

IN THE

PRECEDING SECTION,

SO AS TO SATISFY THE GEOMETRICAL RELATIONS SUBSISTING AMONG THE DIFFERENT PARTS OF THE SYSTEM OF TRIANGLES.

§ 5.

§ 5. INVESTIGATION OF THE CORRECTIONS TO BE APPLIED TO THE NUMBERED ANGLES IN THE PRECEDING SECTION, SO AS TO SATISFY THE GEOMETRICAL RELATIONS SUBSISTING AMONG THE DIFFERENT PARTS OF THE SYSTEM OF TRIANGLES.

The triangulation of the Arc of the Meridian admits of being divided into two independent portions or figures,—viz., the series south of the side Heerenlogement's Berg, Ceder Berg; and that north of the side Heerenlogement's Berg, Klip Rug. These two portions are separately discussed; and as the several steps of the process are alike in each case, they are distinguished for convenience by the same symbols (A), (B), (C), &c.

In the formation of the equations of condition, the numerical values of the angles are increased by indeterminate corrections x_1, x_2, x_3, ... &c., (which are distinguished from each other, by having the same numeral suffixed as that annexed to the angle in the preceding section), and it is our object to determine these corrections so as to satisfy all the relations of the figure, as well as the condition that the sum of their squares shall be a minimum.

The equations are separated into three classes, viz.:

(A) Those depending on the condition that the sum of the angles of a geodetical triangle is equal to 180°, + the spherical excess;

(B) Those deduced from the relations subsisting among the observed angles at a station; and

(C) The equations arising from the geometrical relations of the figure.

The formations of these equations is given in detail; those of the class (A) perhaps require no further explanation here. The second class (B) are of an equally simple form, and are obtained by equating to 360°, the sum of the angles measured round the horizon at a station point; or in cases where an angle is made up by the sums or differences of two independent sets of angles, by equating the value given by one set to that given by the other. The third class (C) (called *side equations* by Bessel) are obtained in the following manner.

When in a system of triangles, the second has a side a in common with the first; the third a side b in common with the second, and so on to the last, which has a side m in common with the first;—if we form the identical equation:

$$1 = \frac{a}{m} \times \frac{b}{a} \times \frac{c}{b} \times \ldots . \frac{m}{l}$$

and for the ratios $\frac{a}{m}, \frac{b}{a}$ .... we substitute the ratios of the sines of the opposite angles (each angle being diminished by $\frac{1}{3}$ of the spherical excess of the triangle to which it belongs) an equation is obtained among the angles of the system.

The readiest way of treating this class of equations is by logarithms.

For supposing a "side equation," to be represented by the following expression, § 5.

$$1 = \frac{\text{sin. } A_1. \quad \text{sin. } A_3. \quad \text{sin. } A_5.}{\text{sin. } A_2. \quad \text{sin. } A_4. \quad \text{sin. } A_6.}$$

let the angles A_1, A_2, A_3, ..., respectively receive a small increment x_1, x_2, x_3, ..., then taking the logarithms of both sides, and remembering that the effect of a small increase of x seconds in an angle (A), upon the logarithm of the sine of the angle is $=$ M cotan. Ax sin. 1″ very nearly, (M being the modulus) we obtain the equation

$$0 = \text{log. sine } A_1 + \text{log. sine } A_3 + \text{log. sine } A_5 - (\text{log. sine } A_2 + \text{log. sine } A_4 + \text{log. sine } A_6)$$
$$+ \text{m cot } A_1 \, x_1 + \text{m cot } A_3 \, x_3 + \text{m cot } A_5 \, x_5 - (\text{m cot } A_2 \, x_2 + \text{m cot } A_4 \, x_4 + \text{m cot } A_6 \, x_6)$$

where m $=$ M sine 1″, or log. m $=$ 1·32336 if we refer the co-efficients to the seventh decimal place of logarithms.

In the calculation of the side equations, the eighth decimal place of the logarithms of the sines of the angles is given, but this is not correct in all cases. Tables exceeding seven places were not available when the computations were in progress.

The equations of condition thus obtained are abstracted and exhibited in detail in the group (D), for each division of the triangulation separately; and the succeeding steps, having reference to the determination of the numerical values of the corrections, may be shortly described as follows.

Each equation 1, 2, 3, ... is multiplied by an undetermined factor $f_1, f_2, f_3, \ldots$ then collecting and adding together the factors by which the like errors are multiplied, with their respective signs and numerical co-efficients, and equating the sum to the same error multiplied by its weight, the system of equations, marked (E) is obtained; and by reduction, the values of x_1, x_2, x_3, ... in terms of the factors $f_1, f_2, f_3, \ldots$ are deduced, as given in the group (F). The next step is to substitute these expressions for x_1, x_2, x_3, ... in the equations of condition, and by this process we obtain a system of equations (G) from which we can eliminate the unknown quantities $f_1, f_2, f_3 \ldots$

The equations (G) for the *second* division of the work are given in full, as they involve only nineteen unknown quantities; but in the *first* division they amount to 68, and occupy too great an area of paper to admit of being explicitly arranged.

The next group (H) exhibits the logarithms of the values of $f_1, f_2, f_3, \ldots$ which are obtained by elimination from the equations (G). Finally, substituting these values in the equations (F), the corrections x_1, x_2, x_3, ... are obtained.

The preceding method of investigating the corrections is in accordance with that of Gauss and Bessel, as explained by Rosenberger, in Nos. 121, 122, of the Astronomische Nachrichten; and by Mr. Galloway, in the 15th volume of the Memoirs of the Royal Astronomical Society.

§ 5.
(A) Triangulation south of the side Ceder Berg—Heerenlogement's Berg.

Formation of the Equations of Condition.

Nos of the Equations.	STATION POINTS.	ANGLES. ° ′ ″	EQUATIONS OF CONDITION.
1	Kapoc Berg.......... East end of Base...... West end of Base...... Sum.......... $180^\circ+\varepsilon$.	$33\cdot37\cdot47\cdot12+x_{20}$ $44\cdot53\cdot24\cdot99+x_3$ $101\cdot28\cdot48\cdot55+x_1$ $180\cdot\ 0\cdot\ 0\cdot66$ $180\cdot\ 0\cdot\ 0\cdot541$	$0=0''\cdot119+x_1+x_3+x_{20}$
2	Riebeek's Kasteel...... East end of Base...... Kapoc Berg.......... Sum.......... $180^\circ+\varepsilon$.	$33\cdot50\cdot58\cdot30+x_{27}$ $93\cdot29\cdot48\cdot40+x_5$ $52\cdot39\cdot15\cdot42+x_9$ $180\cdot\ 0\cdot\ 2\cdot12$ $180\cdot\ 0\cdot\ 1\cdot932$	$0=0''\cdot188+x_5+x_9+x_{27}$
3	K. F. Contre Berg.... East end of Base...... West end of Base...... Sum.......... $180^\circ+\varepsilon$.	$39\cdot29\cdot18\cdot20+x_{24}$ $62\cdot58\cdot29\cdot91+x_6$ $77\cdot32\cdot12\cdot82+x_2$ $180\cdot\ 0\cdot\ 0\cdot93$ $180\cdot\ 0\cdot\ 0\cdot592$	$0=0''\cdot338+x_2+x_6+x_{24}$
4	Drie Fontein......... East end of Base...... K. F. Contre Berg.... Sum.......... $180^\circ+\varepsilon$.	$50\cdot41\cdot39\cdot63+x_{26}$ $63\cdot\ 7\cdot21\cdot43+x_4$ $66\cdot11\cdot\ 0\cdot07+x_{23}$ $180\cdot\ 0\cdot\ 1\cdot13$ $180\cdot\ 0\cdot\ 1\cdot077$	$0=0''\cdot053+x_4+x_{23}+x_{26}$
5	Zwart Berg.......... East end of Base...... Drie Fontein......... Sum.......... $180^\circ+\varepsilon$.	$44\cdot40\cdot29\cdot04+x_{35}$ $86\cdot35\cdot55\cdot16+x_7$ $48\cdot43\cdot36\cdot35+x_{25}$ $180\cdot\ 0\cdot\ 0\cdot55$ $180\cdot\ 0\cdot\ 1\cdot523$	$0=-0''\cdot973+x_7+x_{25}+x_{35}$
6	Riebeek's Kasteel...... Zwart Berg.......... East end of Base...... Sum.......... $180^\circ+\varepsilon$.	$43\ \ 2\cdot26\cdot42+x_{29}$ $62\cdot38\cdot59\cdot93+x_{38}$ $74\cdot18\cdot35\cdot66+x_8$ $180\cdot\ 0\cdot\ 2\cdot01$ $180\cdot\ 0\cdot\ 2\cdot043$	$0=-0''\cdot033+x_8+x_{29}+x_{38}$
7	Kapoc Berg.......... Zwart Berg.......... Riebeek's Kasteel...... Sum.......... $180^\circ+\varepsilon$.	$46\cdot16\cdot30\cdot70+x_{22}$ $56\cdot50\cdot\ 8\cdot85+x_{37}$ $76\cdot53\cdot24\cdot72+x_{27}+x_{29}$ $180\cdot\ 0\cdot\ 4\cdot27$ $180\cdot\ 0\cdot\ 3\cdot661$	$0=0''\cdot609+x^{22}+x_{27}+x_{29}+x^{37}$

§ 5. (A) Triangulation south of the side Ceder Berg—Heerenlogement's Berg.

Formation of the Equations of Condition.

Nos. of the Equations.	STATION POINTS.	ANGLES.	EQUATIONS OF CONDITION.
		° ′ ″	
8	Piket Berg...........	30· 5·58·55+x_{48}	
	Kapoc Berg...........	69·21·31·06+x_{13}	$0=0''\cdot956+x_{13}+x_{28}+x_{48}$
	Riebeek's Kasteel......	80·32·39·36+x_{28}	
	Sum..........	180· 0· 8·97	
	180°+ε.	180· 0· 8·014	
9	Patrys Berg..........	41· 0·47·77+x_{41}	
	Zwart Berg..........	78·49· 2·39+x_{34}	$0=-1''\cdot394+x_{11}+x_{34}+x_{41}$
	Kapoc Berg..........	60·10·16·09+x_{11}	
	Sum..........	180· 0· 6·25	
	180°+ε.	180· 0· 7·644	
10	Patrys Berg..........	40·49·18·04+x_{40}	
	Piket Berg...........	88· 2·38·53+x_{49}	$0=-1''\cdot296+x_{36}+x_{40}+x_{49}$
	Zwart Berg..........	× 51· 8· 7·38+x_{36}	
	Sum..........	180· 0· 3·95	
	180°+ε.	180· 0· 5·246	
11	Patrys Berg..........	81·50· 5·81+$x_{40}+x_{41}$	
	Kapoc Berg..........	37· 5·15·73+$x_{11}-x_{13}+x_{22}$	$0=0''\cdot387+x_{11}-x_{13}+x_{22}+x_{40}+x_{41}+x_{43}$
	Piket Berg...........	61· 4·47·83+x_{43}	
	Sum..........	180· 0· 9·37	
	180°+ε.	180· 0· 8·983	
12	Eland's Berg.........	51·13·56·10+x_{57}	
	Piket Berg...........	83·57·35·08+x_{44}	$0=0''\cdot959+x_{39}+x_{44}+x_{57}$
	Patrys Berg..........	44·48·35·40+x_{39}	
	Sum..........	180· 0· 6·58	
	180°+ε.	180· 0· 5·621	
13	Lambert's Hoek.......	59·53·53·79+x_{59}	
	Eland's Berg.........	67·45·33·23+$x_{54}+x_{56}-x_{55}$	$0=-4''\cdot277+x_{45}+x_{54}-x_{55}+x_{56}+x_{59}$
	Piket Berg...........	52·20·33·03+x_{45}	
	Sum..........	180· 0· 0·05	
	180°+ε.	180· 0· 4·327	
14	Heerenlogement's Berg.	55·31·38·25+x_{69}	
	Eland's Berg.........	58·41·16·52+x_{55}	$0=-0''\cdot824+x_{55}+x_{58}+x_{69}$
	Lambert's Hoek.......	65·47· 8·45+x_{58}	
	Sum..........	180· 0· 3·22	
	180°+ε.	180· 0· 4·044	

§ 5. (A) Triangulation south of the side Ceder Berg—Heerenlogement's Berg.

Formation of the Equations of Condition.

Nos. of the Equations.	STATION POINTS.	ANGLES.	EQUATIONS OF CONDITION.
		° ′ ″	
15	Heerenlogement's Berg. Eland's Berg......... Piket Berg..........	$26 \cdot 35 \cdot 57 \cdot 19 + x_{64} - x_{66}$ $126 \cdot 26 \cdot 49 \cdot 75 + x_{54} + x_{56}$ $26 \cdot 57 \cdot 13 \cdot 26 + x_{47}$	$0 = -3'' \cdot 960 + x_{47} + x_{54} + x_{56} + x_{64} - x_{66}$
	Sum.......... $180^\circ + \varepsilon$.	180· 0· 0·20 180· 0· 4·160	
16	Ceder Berg.......... Piket Berg.......... Eland's Berg.........	$35 \cdot 18 \cdot 16 \cdot 07 + x_{61}$ $81 \cdot 58 \cdot 17 \cdot 84 + x_{46} + x_{47}$ $62 \cdot 43 \cdot 30 \cdot 27 + x_{54}$	$0 = -3'' \cdot 600 + x_{46} + x_{47} + x_{54} + x_{61}$
	Sum.......... $180^\circ + \varepsilon$.	180· 0· 4·18 180· 0· 7·780	
17	Ceder Berg.......... Piket Berg.......... Heerenlogement's Berg.	$70 \cdot 57 \cdot 46 \cdot 03 + x_{62}$ $55 \cdot 1 \cdot 4 \cdot 58 + x_{46}$ $54 \cdot 1 \cdot 20 \cdot 07 + x_{66}$	$0 = -0'' \cdot 886 + x_{46} + x_{62} + x_{66}$
	Sum.......... $180^\circ + \varepsilon$.	180· 0·10·68 180· 0·11·566	
18	Kapitein's Kloof...... Patrys Berg......... Kapoc Berg.........	$62 \cdot 23 \cdot 20 \cdot 32 + x_{50}$ $78 \cdot 40 \cdot 51 \cdot 71 + x_{42}$ $38 \cdot 55 \cdot 59 \cdot 05 + x_{12}$	$0 = 1'' \cdot 920 + x_{12} + x_{42} + x_{50}$
	Sum.......... $180^\circ + \varepsilon$.	180· 0·11·08 180· 0· 9·160	
19	Winter Berg.......... Kapitein's Kloof...... Kapoc Berg..........	$65 \cdot 19 \cdot 23 \cdot 84 + x_{142}$ $62 \cdot 40 \cdot 54 \cdot 74 + x_{53}$ $51 \cdot 59 \cdot 52 \cdot 57 + x_{10}$	$0 = -1'' \cdot 277 + x_{10} + x_{53} + x_{142}$
	Sum.......... $180^\circ + \varepsilon$.	180· 0·11·15 180· 0·12·427	
20	Ceder Berg.......... Kapitein's Kloof...... Winter Berg.........	$53 \cdot 2 \cdot 11 \cdot 23 + x_{63}$ $74 \cdot 43 \cdot 2 \cdot 58 + x_{51}$ $52 \cdot 15 \cdot 2 \cdot 07 + x_{143}$	$0 = 4'' \cdot 320 + x_{51} + x_{63} + x_{143}$
	Sum.......... $180^\circ + \varepsilon$.	180· 0·15·88 180· 0·11·560	
21	Heerenlogement's Berg. Kapitein's Kloof...... Ceder Berg..........	$52 \cdot 26 \cdot 6 \cdot 12 + x_{65}$ $54 \cdot 2 \cdot 22 \cdot 86 + x_{52}$ $73 \cdot 31 \cdot 44 \cdot 97 + x_{60}$	$0 = 2'' \cdot 317 + x_{52} + x_{60} + x_{65}$.
	Sum.......... $180^\circ + \varepsilon$.	180· 0·13·95 180· 0·11·633	

§ 5. (A) Triangulation south of the side Ceder Berg—Heerenlogement's Berg.

Formation of the Equations of Condition.

Nos of the Equations.	STATION POINTS.	ANGLES.	EQUATIONS OF CONDITION.
		° ′ ″	
22	Rogge Bay	$33 \cdot 33 \cdot 35 \cdot 14 + x_{107}$	
	Kapoc Berg..........	$98 \cdot 13 \cdot 19 \cdot 23 + x_{17}$	$0 = 1'' \cdot 367 + x_{17} + x_{32} + x_{107}$
	Riebeek's Kasteel......	$48 \cdot 13 \cdot 12 \cdot 81 + x_{32}$	
	Sum..........	$180 \cdot \ 0 \cdot \ 7 \cdot 18$	
	$180° + \varepsilon$.	$180 \cdot \ 0 \cdot \ 5 \cdot 813$	
23	Simon's Berg.........	$91 \cdot 23 \cdot 47 \cdot 49 + x_{123}$	
	Rogge Bay	$50 \cdot 58 \cdot 58 \cdot 02 + x_{108}$	$0 = -1'' \cdot 541 - x_{32} + x_{33} + x_{108} + x_{123}$
	Riebeek's Kasteel......	$37 \cdot 37 \cdot 19 \cdot 57 + x_{33} - x_{32}$	
	Sum..........	$180 \cdot \ 0 \cdot \ 5 \cdot 08$	
	$180° + \varepsilon$.	$180 \cdot \ 0 \cdot \ 6 \cdot 621$	
24	Simon's Berg.........	$37 \cdot \ 5 \cdot 45 \cdot 63 + x_{120}$	
	Kapoc Berg..........	$57 \cdot \ 3 \cdot 45 \cdot 96 + x_{14}$	
	Riebeek's Kasteel......	$85 \cdot 50 \cdot 32 \cdot 38 + x_{33}$	$0 = -2'' \cdot 072 + x_{14} + x_{33} + x_{120}$
	Sum..........	$180 \cdot \ 0 \cdot \ 3 \cdot 97$	
	$180° + \varepsilon$.	$180 \cdot \ 0 \cdot \ 6 \cdot 042$	
25	Royal Observatory....	$34 \cdot 30 \cdot \ 6 \cdot 59 + x_{110}$	
	Kapoc Berg..........	$93 \cdot 20 \cdot 23 \cdot 15 + x_{16}$	$0 = 1'' \cdot 520 + x_{16} + x_{31} + x_{110}$
	Riebeek's Kasteel.....	$52 \cdot \ 9 \cdot 37 \cdot 84 + x_{31}$	
	Sum..........	$180 \cdot \ 0 \cdot \ 7 \cdot 58$	
	$180° + \varepsilon$.	$180 \cdot \ 0 \cdot \ 6 \cdot 060$	
26	Simon's Berg.........	$57 \cdot 18 \cdot \ 3 \cdot 07 + x_{122}$	
	Royal Observatory....	$86 \cdot 25 \cdot 25 \cdot 01 + x_{111}$	$0 = -0'' \cdot 669 - x_{14} + x_{16} + x_{111} + x_{122}$
	Kapoc Berg..........	$36 \cdot 16 \cdot 37 \cdot 19 + x_{16} - x_{14}$	
	Sum..........	$180 \cdot \ 0 \cdot \ 5 \cdot 27$	
	$180° + \varepsilon$.	$180 \cdot \ 0 \cdot \ 5 \cdot 939$	
27	King's Battery........	$32 \cdot 58 \cdot 17 \cdot 12 + x_{126}$	
	Kapoc Berg..........	$95 \cdot 53 \cdot 41 \cdot 99 + x_{15}$	$0 = 0'' \cdot 194 + x_{15} + x_{30} + x_{126}$
	Riebeek's Kasteel......	$51 \cdot \ 8 \cdot \ 7 \cdot 28 + x_{30}$	
	Sum..........	$180 \cdot \ 0 \cdot \ 6 \cdot 39$	
	$180° + \varepsilon$.	$180 \cdot \ 0 \cdot \ 6 \cdot 196$	
28	Simon's Berg.........	$59 \ \ 0 \cdot \ 2 \cdot 68 + x_{121}$	
	King's Battery........	$82 \cdot 10 \cdot 10 \cdot 20 + x_{127}$	$0 = 2'' \cdot 451 - x_{14} + x_{15} + x_{121} + x_{127}$
	Kapoc Berg..........	$38 \cdot 49 \cdot 56 \cdot 03 + x_{15} - x_{14}$	
	Sum..........	$180 \cdot \ 0 \cdot \ 8 \cdot 91$	
	$180° + \varepsilon$.	$180 \cdot \ 0 \cdot \ 6 \cdot 459$	

§ 5. (A) Triangulation south of the side Ceder Berg—Heerenlogement's Berg.

Formation of the Equations of Condition.

Nos. of the Equations.	STATION POINTS.	ANGLES.	EQUATIONS OF CONDITION.
		° ′ ″	
29	Sneeuw Kop......... Royal Observatory.... Kapoc Berg..........	$37 \cdot 59 \cdot 42 \cdot 13 + x_{138}$ $111 \cdot 3 \cdot 1 \cdot 66 + x_{112}$ $30 \cdot 57 \cdot 20 \cdot 91 + x_{19}$	$0 = -1'' \cdot 900 + x_{19} + x_{112} + x_{138}$
	Sum.......... $180° + \varepsilon$.	$180 \cdot 0 \cdot 4 \cdot 70$ $180 \cdot 0 \cdot 6 \cdot 600$	
30	Sneeuw Kop......... King's Battery........ Kapoc Berg..........	$40 \cdot 37 \cdot 30 \cdot 22 + x_{137}$ $105 \cdot 51 \cdot 56 \cdot 65 + x_{128}$ $33 \cdot 30 \cdot 39 \cdot 75 + x_{18}$	$0 = -0'' \cdot 648 + x_{18} + x_{128} + x_{137}$
	Sum.......... $180° + \varepsilon$.	$180 \cdot 0 \cdot 6 \cdot 62$ $180 \cdot 0 \cdot 7 \cdot 268$	
31	Sneeuw Kop......... Kapoc Berg.......... Winter Berg.........	$46 \cdot 56 \cdot 49 \cdot 07 + x_{136}$ $77 \cdot 53 \cdot 57 \cdot 41 + x_{21}$ $55 \cdot 9 \cdot 32 \cdot 39 + x_{144}$	$0 = 1'' \cdot 936 + x_{21} + x_{136} + x_{144}$
	Sum.......... $180° + \varepsilon$.	$180 \cdot 0 \cdot 18 \cdot 87$ $180 \cdot 0 \cdot 16 \cdot 934$	
32	Zwart Kop........... Royal Observatory.... Sneeuw Kop.........	$63 \cdot 11 \cdot 52 \cdot 22 + x_{148}$ $79 \cdot 54 \cdot 10 \cdot 43 + x_{114}$ $36 \cdot 54 \cdot 1 \cdot 86 + x_{141}$	$0 = 0'' \cdot 597 + x_{114} + x_{141} + x_{148}$
	Sum.......... $180° + \varepsilon$.	$180 \cdot 0 \cdot 4 \cdot 51$ $180 \cdot 0 \cdot 3 \cdot 913$	
33	Zwart Kop........... King's Battery....... Sneeuw Kop.........	$67 \cdot 32 \cdot 22 \cdot 00 + x_{146}$ $78 \cdot 11 \cdot 29 \cdot 08 + x_{133}$ $34 \cdot 16 \cdot 13 \cdot 77 + x_{140}$	$0 = 1'' \cdot 029 + x_{133} + x_{140} + x_{146}$
	Sum.......... $180° + \varepsilon$.	$180 \cdot 0 \cdot 4 \cdot 85$ $180 \cdot 0 \cdot 3 \cdot 821$	
34	Zwart Kop........... Royal Observatory.... Simon's Berg.........	$42 \cdot 39 \cdot 59 \cdot 35 + x_{149}$ $104 \cdot 31 \cdot 47 \cdot 08 + x_{113}$ $32 \cdot 48 \cdot 19 \cdot 34 + x_{125}$	$0 = 2'' \cdot 532 + x_{113} + x_{125} + x_{149}$
	Sum.......... $180° + \varepsilon$.	$180 \cdot 0 \cdot 5 \cdot 77$ $180 \cdot 0 \cdot 3 \cdot 238$	
35	Zwart Kop........... King's Battery........ Simon's Berg.........	$47 \cdot 0 \cdot 29 \cdot 13 + x_{145}$ $101 \cdot 53 \cdot 15 \cdot 53 + x_{130}$ $31 \cdot 6 \cdot 19 \cdot 73 + x_{124}$	$0 = 1'' \cdot 094 + x_{124} + x_{130} + x_{145}$
	Sum.......... $180° + \varepsilon$.	$180 \cdot 0 \cdot 4 \cdot 39$ $180 \cdot 0 \cdot 3 \cdot 296$	

§ 5. (A) Triangulation south of the side Ceder Berg—Heerenlogement's Berg.

Formation of the Equations of Condition.

Nos. of the Equations.	STATION POINTS.	ANGLES.	EQUATIONS OF CONDITION.
		° ′ ″	
36	Cape Point...........	40· 8· 5·82 + x_{151}	
	King's Battery.......	98·11·10·78 + x_{131}	$0=1''\cdot030+x_{119}+x_{131}+x_{151}$
	Simon's Berg.........	41·40·49·30 + x_{119}	
	Sum..........	180· 0· 5·90	
	180° + ε.	180· 0· 4·870	
37	Cape Point...........	57· 8· 0·04 + x_{152}	
	King's Battery.......	74·29·24·33 + x_{132}	$0=-0''\cdot354+x_{132}+x_{134}+x_{152}$
	Sneeuw Kop.........	48·22·40·77 + x_{134}	
	Sum..........	180· 0· 5·14	
	180° + ε.	180· 0· 5·494	
38	Meridian Mark.......	55·28·34·51 + x_{117}	
	Royal Observatory....	103·38·51·57 + x_{109}	$0=1''\cdot097+x_{109}+x_{117}+x_{139}$
	Sneeuw Kop.........	20·52·37·50 + x_{139}	
	Sum..........	180· 0· 3·58	
	180° + ε.	180· 0· 2·483	
39	Meridian Mark.......	61·36·22·89 + x_{115}	
	King's Battery.......	94·53·16·71 + x_{129}	$0=2''\cdot296+x_{115}+x_{129}-x_{134}+x_{135}$
	Sneeuw Kop.........	23·30·25·59 − x_{134} + x_{135}	
	Sum..........	180· 0· 5·19	
	180° + ε.	180· 0· 2 894	
40	Meridian Mark.......	57·38·15·53 + x_{118}	
	Zwart Kop...........	64·35·14·39 + x_{147}	$0=2''\cdot777+x_{118}+x_{139}+x_{141}+x_{147}$
	Sneeuw Kop.........	57·46·39·36 + x_{139} + x_{141}	
	Sum..........	180· 0· 9·28	
	180° + ε.	180· 0· 6·503	
41	Meridian Mark.......	54·33·53·43 + x_{116}	
	Cape Point...........	53·33· 9·38 + x_{150}	$0=1''\cdot257+x_{116}+x_{135}+x_{150}$
	Sneeuw Kop.........	71·53· 6·36 + x_{135}	
	Sum..........	180· 0· 9·17	
	180° + ε.	180· 0· 7·913	

§ 5. (B) Triangulation south of the side Ceder Berg—Heerenlogement's Berg.

Formation of the Equations of Condition.

Kapoc Berg Station.

The Angle Patrys Berg and Royal Observatory is made up as follows:—

Patrys Berg and Kapitein'sK.	38° 55′ 59″·05 + x_{12}	Patrys Berg and Zwart Berg.	60° 10′ 16″·09 + x_{11}
Kapitein'sK. and Winter Berg	51·59·52·57 + x_{10}	Zwart Berg. and Riebeek's K.	46·16·30·70 + x_{22}
Winter Berg and Sneeuw Kop	77·53·57·41 + x_{21}	Riebeek's K. and Royal Obser.	93·20·23·15 + x_{16}
Sneeuw Kop and Royal Obser.	30·57·20·91 + x_{19}		
Sum............	199·47· 9·94	Sum............	199·47· 9·94

Hence we have: (42): $0 = x_{10} - x_{11} + x_{12} - x_{16} + x_{19} + x_{21} - x_{22}$

Angle: Riebeek's Kasteel and Sneeuw Kop.

Riebeek's K. and King's Batr.	95° 53′ 41″·99 + x_{15}	Riebeek's K. and Royal Obser.	93° 20′ 23″·15 + x_{16}
Sneeuw Kop and „ „	33·30·39·75 + x_{18}	Sneeuw Kop and „ „	30·57·20·91 + x_{19}
Difference........	62·23· 2·24	Difference........	62·23· 2·24

Hence we have: (43): $0 = x_{15} - x_{16} - x_{18} + x_{19}$

Simon's Berg Station.

Angle: King's Battery and Royal Observatory.

King's Batr. and Kapoc Berg.	59° 0′ 2″·68 + x_{121}	Zwart Kop.. and King's Batr.	31° 6′ 19″·73 + x_{124}
RoyalObser. and „ „	57·18· 3·07 + x_{122}	„ „ and Royal Obser.	32·48·19·34 + x_{125}
Difference........	1·41·59·61	Difference........	1·41·59·61

Hence: (44): $0 = x_{121} - x_{122} + x_{124} - x_{125}$

King's Battery Station.

Angle: Cape Point and Zwart Kop.

Simon's Berg and Zwart Kop..	101° 53′ 15″·53 + x_{130}	Sneeuw Kop and Cape Point.	74° 29′ 24″·33 + x_{132}
„ „ and Cape Point.	98·11·10·78 + x_{131}	„ „ and Zwart Kop..	78·11·29·08 + x_{133}
Difference........	3·42· 4·75	Difference........	3·42· 4·75

Hence: (45): $0 = x_{130} - x_{131} + x_{132} - x_{133}$

Angle: Simon's Berg and Sneeuw Kop.

Kapoc Berg. and Simon'sBerg	82° 10′ 10″·20 + x_{127}	Simon'sBerg and Zwart Kop..	101° 53′ 15″·53 + x_{130}
„ „ and Sneeuw Kop	105·51·56·65 + x_{128}	Sneeuw Kop and „ „	78·11·29·08 + x_{133}
Difference........	23·41·46·45	Difference........	23·41·46·45

Hence: (46): $0 = x_{127} - x_{128} + x_{130} - x_{133}$

§ 5. (B) Triangulation south of the side Ceder Berg—Heerenlogement's Berg.

Formation of the Equations of Condition.

SNEEUW KOP STATION.

Angle: King's Battery and Royal Observatory.

	° ′ ″		° ′ ″
Royal Obser. and Kapoc Berg.	$37 \cdot 59 \cdot 42 \cdot 13 + x_{138}$	Zwart Kop.. and King's Batr.	$34 \cdot 16 \cdot 13 \cdot 77 + x_{140}$
King's Batr. and ,, ,,	$40 \cdot 37 \cdot 30 \cdot 22 + x_{137}$	,, ,, and Royal Obser.	$36 \cdot 54 \cdot 1 \cdot 86 + x_{141}$
Difference........	$2 \cdot 37 \cdot 48 \cdot 09$	Difference........	$2 \cdot 37 \cdot 48 \cdot 09$

Hence: (47) $0 = x_{137} - x_{138} + x_{140} - x_{141}$

Angle: Cape Point and Blaauw Berg Meridian Mark.

Cape Point and King's Battery......	$48 \cdot 22 \cdot 40 \cdot 77 + x_{134}$
Zwart Kop and Royal Observatory...	$36 \cdot 54 \cdot 1 \cdot 86 + x_{141}$
Royal Observatory and Blaauw Berg.	$20 \cdot 52 \cdot 37 \cdot 50 + x_{139}$
Sum............	$106 \cdot 9 \cdot 20 \cdot 13$
Zwart Kop and King's Battery.......	$34 \cdot 16 \cdot 13 \cdot 77 + x_{140}$
Difference.......	$71 \cdot 53 \cdot 6 \cdot 36$
Cape Point and Blaauw Berg........	$71 \cdot 53 \cdot 6 \cdot 36 + x_{135}$

Hence: (48) $0 = x_{134} - x_{135} + x_{139} - x_{140} + x_{141}$

ROYAL OBSERVATORY STATION.

Angle: Simon's Berg and Sneeuw Kop

	° ′ ″		° ′ ″
Kapoc Berg. and Simon'sBerg	$86 \cdot 25 \cdot 25 \cdot 01 + x_{111}$	Simon'sBerg and Zwart Kop..	$104 \cdot 31 \cdot 47 \cdot 08 + x_{113}$
,, ,, and Sneeuw Kop	$111 \cdot 3 \cdot 1 \cdot 66 + x_{112}$	Sneeuw Kop and ,, ,,	$79 \cdot 54 \cdot 10 \cdot 43 + x_{114}$
Difference........	$24 \cdot 37 \cdot 36 \cdot 65$	Difference........	$24 \cdot 37 \cdot 36 \cdot 65$

Hence: (49) $0 = x_{111} - x_{112} + x_{113} - x_{114}$

ZWART KOP STATION.

Angle: Simon's Berg and Sneeuw Kop.

	° ′ ″		° ′ ″
King's Batr. and Simon'sBerg	$47 \cdot 0 \cdot 29 \cdot 13 + x_{145}$	RoyalObser. and Sneeuw Kop	$63 \cdot 11 \cdot 52 \cdot 22 + x_{148}$
,, ,, and Sneeuw Kop	$67 \cdot 32 \cdot 22 \cdot 00 + x_{146}$	,, ,, and Simon'sBerg	$42 \cdot 39 \cdot 59 \cdot 35 + x_{149}$
Difference........	$20 \cdot 31 \cdot 52 \cdot 87$	Difference........	$20 \cdot 31 \cdot 52 \cdot 87$

Hence: (50): $0 = x_{145} - x_{146} + x_{148} - x_{149}$

§ 5. (C) Triangulation south of the side Ceder Berg—Heerenlogement's Berg.

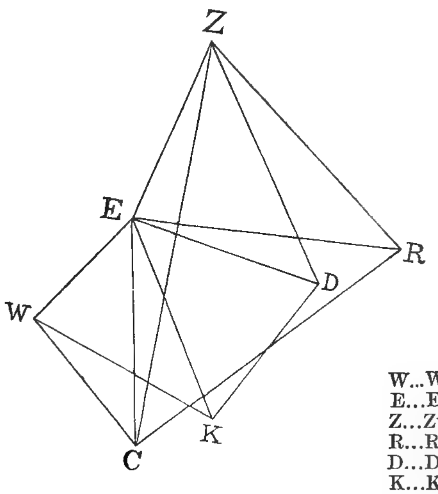
Formation of the Equations of Condition.

In the quadrilateral EZRC we have the following:

$$\frac{CR}{ZR}\times\frac{ZR}{ER}\times\frac{ER}{CR}=1$$

Therefore:

$$\frac{\text{Sin. CZR. Sin. ZER. Sin. ECR.}}{\text{Sin. ZCR. Sin. EZR. Sin. CER.}}=1$$



W...West end of Base.
E...East end of Base.
Z...Zwart Berg.
R...Riebeek's Kasteel.
D...Drie Fontein.
K...K.F. Contre Berg.
C...Kapoc Berg.

CALCULATION.

	ANGLES.	$\frac{1}{3}\varepsilon$.	ANGLES—$\frac{1}{3}\varepsilon$.	LOG. SINES.	CO-EFFICIENTS OF THE CORRECTIONS.
CZR	56° 50′ 8″·85	1″·220	56° 50′ 7″·630	9·9227788·8	13·760 x_{37}
ZER	74·18·35·66	0·681	74·18·34·979	9·9835080·0	5·914 x_8
ECR	52·39·15·42	0·643	52·39·14·777	9·9003604·3	16·066 x_9
			Sum..	9·8066473·1	
ZCR	46·16·30·70	1·220	46·16·29·480	9·8589363·6	20·139 x_{22}
EZR	62·38·59·93	0·681	62·38·59·249	9·9485180·7	10·891 x_{38}
CER	93·29·48·40	0·643	93·29·47·757	9·9991907·5	— 1·287 x_5
			Sum..	9·8066451·8	

(51): $0=21\cdot3+1\cdot287x_5+5\cdot914x_8+16\cdot066x_9-20\cdot139x_{22}+13\cdot760x_{37}-10\cdot891x_{38}$

In the figure above we have:

$$\frac{WE}{EC}\times\frac{EC}{CR}\times\frac{CR}{ZR}\times\frac{ZR}{ZE}\times\frac{ZE}{DE}\times\frac{DE}{KE}\times\frac{KE}{WE}=1$$

Consequently:

$$\frac{\text{Sin. WCE. Sin. ERC. Sin. CZR. Sin. ZER. Sin. EDZ. Sin. EKD. Sin. EWK.}}{\text{Sin. EWC. Sin. CER. Sin. ZCR. Sin. ERZ. Sin. EZD. Sin. EDK. Sin. WKE.}}=1$$

§ 5. (C) Triangulation south of the side Ceder Berg—Heerenlogement's Berg.

Formation of the Equations of Condition.

CALCULATION.

	ANGLES.	$\frac{1}{3}\varepsilon$.	ANGLES—$\frac{1}{3}\varepsilon$.	LOG. SINES.	CO-EFFICIENTS OF THE CORRECTIONS.
WCE	33°37′47″·12	0″·180	33°37′46″·940	9·7433712·1	31·655 x_{20}
ERC	33·50·58·30	0·643	33·50·57·657	9·7458639·0	31·394 x_{27}
CZR	56·50· 8·85	1·220	56·50· 7·630	9·9227788·8	13·760 x_{37}
ZER	74·18·35·66	0·681	74·18·34·979	9·9835080·0	5·914 x_{8}
EDZ	48·43·36·35	0·508	48·43·35·842	9·8759698·2	18·480 x_{25}
EKD	66·11 0·07	0·359	66·10·59·711	9·9613459·4	9·294 x_{23}
EWK	77·32·12·82	0·197	77·32·12·623	9·9896433·1	4·654 x_{2}
			Sum..	9·2224810·6	
EWC	101·28·48·55	0·180	101·28·48·370	9·9912233·5	− 4·276 x_{1}
CER	93·29·48·40	0·643	93·29·47·757	9·9991907·5	− 1·287 x_{5}
ZCR	46·16·30·70	1·220	46·16·29·480	9·8589363·6	20·139 x_{22}
ERZ	43· 2·26·42	0·681	43· 2·25·739	9·8341121·3	22·547 x_{29}
EZD	44·40·29·04	0·508	44·40·28·532	9·8470044·2	21·295 x_{35}
EDK	50·41·39·63	0·359	50·41·39·271	9·8886155·6	17·237 x_{26}
WKE	39·29·18·20	0·197	39·29·18·003	9·8034032·0	25·553 x_{24}
			Sum..	9·2224857·7	

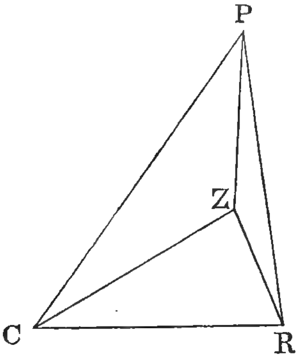
$$(52):\ 0=47{\cdot}1-4{\cdot}276x_1-4{\cdot}654x_2-1{\cdot}287x_5-5{\cdot}914x_8-31{\cdot}655x_{20}+20{\cdot}139x_{22}-9{\cdot}294x_{23}$$
$$+25{\cdot}553x_{24}-18{\cdot}480x_{25}+17{\cdot}237x_{26}-31{\cdot}394x_{27}+22{\cdot}547x_{29}+21{\cdot}295x_{35}-13{\cdot}760x_{37}$$

In the figure PCRZ we have:

$$\frac{CR}{CP}\times\frac{CP}{CZ}\times\frac{CZ}{CR}=1$$

Consequently:

$$\frac{\text{Sin. CPR. Sin. CZP. Sin. CRZ.}}{\text{Sin. CRP. Sin. CPZ. Sin. CZR.}}=1$$



P...Piket Berg,
C...Kapoc Berg.
R...Riebeek's Kasteel.
Z...Zwart Berg.

CALCULATION.

	ANGLES.	$\frac{1}{3}\varepsilon$.	ANGLES—$\frac{1}{3}\varepsilon$.	LOG. SINES.	CO-EFFICIENTS OF THE CORRECTIONS.
CPR	30° 5′58″·55	2″·671	30° 5′55″·879	9·7002652·7	36·324 x_{48}
CZP	129·57· 9·77	1·302	129·57· 8·468	9·8845567·6	−17·638 $(x_{34}+x_{36})$
CRZ	76·53·24·72	1·220	76·53·23·500	9·9885303·5	4·904 $(x_{27}+x_{29})$
			Sum..	9·5733523·8	

§ 5.
(C)
Triangulation south of the side Ceder Berg—Heerenlogement's Berg.

Formation of the Equations of Condition.

CALCULATION—*continued.*

	ANGLES.	$\frac{1}{3}\varepsilon$.	ANGLES—$\frac{1}{3}\varepsilon$.	LOG. SINES.	CO-EFFICIENTS OF THE CORRECTIONS.
CRP	80° 32′ 39″·36	2″·671	80° 32′ 36″·689	9·9940577·8	3·507 x_{28}
CPZ	26·57·50·70	1·302	26·57·49·398	9·6565066·3	41·389 $(x_{49}-x_{43})$
CZR	56·50· 8·85	1·220	50·50· 7·630	9·9227788·8	13·760 x_{37}
			Sum..	9·5733432·9	

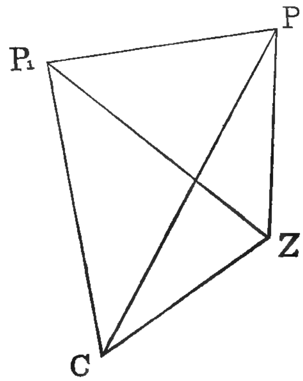
$$(53): \ 0=90 \cdot 9+4 \cdot 904x_{27}-3 \cdot 507x_{28}+4 \cdot 904x_{29}-17 \cdot 638x_{34}-17 \cdot 638x_{36}-13 \cdot 760x_{37}+41 \cdot 389x_{43} +36 \cdot 324x_{48}-41 \cdot 389x_{49}$$

In the figure PP_1CZ we have:

$$\frac{ZC}{ZP} \times \frac{ZP}{ZP_1} \times \frac{ZP_1}{ZC} = 1$$

Consequently:

$$\frac{\text{Sin. } ZPC. \quad \text{Sin. } ZP_1P. \quad \text{Sin. } ZCP_1.}{\text{Sin. } ZCP. \quad \text{Sin. } ZPP_1. \quad \text{Sin. } ZP_1C.} = 1$$



P...Piket Berg.
P_1...Patrys Berg.
C...Kapoc Berg.
Z...Zwart Berg.

CALCULATION.

	ANGLES.	$\frac{1}{3}\varepsilon$.	ANGLES—$\frac{1}{3}\varepsilon$.	LOG. SINES.	CO-EFFICIENTS OF THE CORRECTIONS.
ZPC	26° 57′ 50″·70	1″·302	26° 57′ 49″·398	9·6565066·3	41·389 $(x_{49}-x_{43})$
ZP_1P	40·49·18·04	1·749	40·49·16·291	9·8153788·3	24·374 x_{40}
ZCP_1	60·10·16·09	2·548	60·10·13·542	9·9382739·5	12·073 x_{11}
			Sum..	9·4101594·1	
ZCP	23· 5· 0·36	1·302	23· 4·59·058	9·5933584·8	49·404 $(x_{13}-x_{22})$
ZPP_1	88· 2·38·53	1·749	88· 2·36·781	9·9997467·8	0·723 x_{49}
ZP_1C	41· 0·47·77	2·548	41· 0·45·222	9·8170524·3	24·210 x_{41}
			Sum..	9·4101576·9	

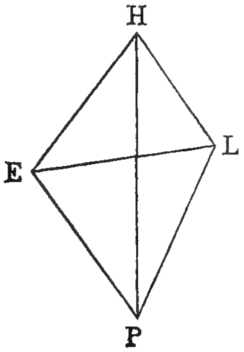
$$(54): \ 0=17 \cdot 2+12 \cdot 073x_{11}-49 \cdot 404x_{13}+49 \cdot 404x_{22}+24 \cdot 374x_{40}-24 \cdot 210x_{41}-41 \cdot 389x_{43}+40 \cdot 666x_{49}$$

§ 5.
(C) Triangulation south of the side Ceder Berg—Heerenlogement's Berg.

Formation of the Equations of Condition.

From the quadrilateral EHLP we obtain:

$$\frac{EL}{EP}\times\frac{EP}{EH}\times\frac{EH}{EL}=1$$



E...Eland's Berg.
H...Heerenlogement's Berg.
L...Lambert's Hoek Berg.
P...Piket Berg.

Therefore:

$$\frac{\text{Sin. EPL. Sin. EHP. Sin. ELH.}}{\text{Sin. ELP. Sin. EPH. Sin. EHL.}}=1$$

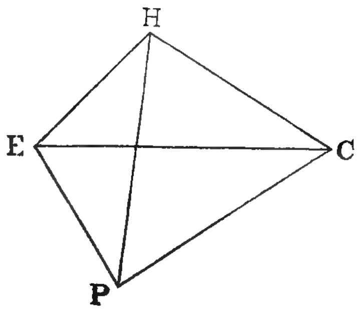
CALCULATION.

	ANGLES.	$\frac{1}{3}\varepsilon$.	ANGLES—$\frac{1}{3}\varepsilon$.	LOG. SINES.	CO-EFFICIENTS OF THE CORRECTIONS.
EPL	52°·20′·33″·03	1″·442	52°·20′·31″·588	9·8985457·0	16·249 x_{45}
EHP	26·35·57·19	1·387	26·35·55·803	9·6510267·8	42·048 $(x_{64}-x_{66})$
ELH	65·47· 8·45	1·348	65·47· 7·102	9·9600019·9	9·469 x_{58}
			Sum..	9·5095744·7	
ELP	59·53·53·79	1·442	59·53·52·348	9·9370828·2	12·207 x_{59}
EPH	26·57·13·26	1·387	26·57·11·873	9·6563512·8	41·406 x_{47}
EHL	55·31·38·25	1·348	55·31·36·902	9·9161338·6	14·456 x_{69}
			Sum..	9·5095679·6	

$$(55):\ 0=65{\cdot}1+16{\cdot}249x_{45}-41{\cdot}406x_{47}+9{\cdot}469x_{58}-12{\cdot}207x_{59}+42{\cdot}048x_{64}-42{\cdot}048x_{66}-14{\cdot}456x_{69}$$

In the quadrilateral EHCP we have:

$$\frac{PH}{PE}\times\frac{PE}{PC}\times\frac{PC}{PH}=1$$



E...Eland's Berg.
H...Heerenlogement's Berg.
C...Ceder Berg.
P...Piket Berg.

Therefore:

$$\frac{\text{Sin. PEH. Sin. PCE. Sin. PHC.}}{\text{Sin. PHE. Sin. PEC. Sin. PCH.}}=1$$

§ 5. (C) Triangulation south of the side Ceder Berg—Heerenlogement's Berg.

Formation of the Equations of Condition.

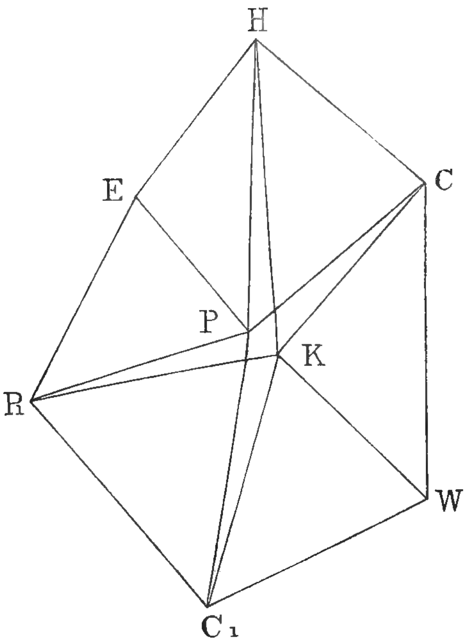
CALCULATION.

	ANGLES.	$\frac{1}{3}\,\varepsilon$.	ANGLES—$\frac{1}{3}\varepsilon$.	LOG. SINES.	CO-EFFICIENTS OF THE CORRECTIONS.
PEH	126° 26′ 49″·75	1″·387	126° 26′ 48″·363	9·9054770·3	$-15·550\ (x_{54}+x_{56})$
PCE	35·18·16·07	2·593	35·18·13·477	9·7618609·3	$29·733\ x_{61}$
PHC	54· 1·20·07	3·855	54· 1·16·215	9·9080742·2	$15·286\ x_{66}$
			Sum..	9·5754121·8	
PHE	26·35·57·19	1·387	26·35·55·803	9·6510267·8	$42·048\ (x_{64}-x_{66})$
PEC	62·43·30·27	2·593	62·43·27·677	9·9488099·5	$10·856\ x_{54}$
PCH	70·57·46·03	3·855	70·57·42·175	9·9755700·2	$7·266\ x_{62}$
			Sum..	9·5754067·5	

$$(56):\ 0=54·3-26·406_{54}-15·550x_{56}+29·733x_{61}-7·266x_{62}-42·048x_{64}+57·334x_{66}$$

From the annexed figure we obtain:

$$\frac{HC}{KC}\times\frac{KC}{KW}\times\frac{KW}{KC_{\rm I}}\times\frac{KC_{\rm I}}{C_{\rm I}P_{\rm I}}\times\frac{C_{\rm I}P_{\rm I}}{PP_{\rm I}}\times\frac{PP_{\rm I}}{PE}\times\frac{PE}{PH}\times\frac{PH}{HC}=1$$



H...Heerenlogement's Berg.
C...Ceder Berg.
W...Winter Berg.
$C_{\rm I}$...Capoc Berg.
$P_{\rm I}$...Patrys Berg.
E...Eland's Berg.
P...Piket Berg.
K...Kapitein's Kloof.

$$\frac{\text{Sin. HKC. Sin. KWC. Sin. KC}_{\rm I}\text{W. Sin. C}_{\rm I}\text{P}_{\rm I}\text{K. Sin. P}_{\rm I}\text{PC}_{\rm I}\text{. Sin. PEP}_{\rm I}\text{. Sin. PHE. Sin. HCP.}}{\text{Sin. CHK. Sin. KCW. Sin. KWC}_{\rm I}\text{. Sin. C}_{\rm I}\text{KP}_{\rm I}\text{. Sin. P}_{\rm I}\text{C}_{\rm I}\text{P. Sin. PP}_{\rm I}\text{E. Sin. PEH. Sin. HPC.}}=1$$

§ 5. (C) Triangulation south of the side Ceder Berg—Heerenlogement's Berg.

Formation of the Equations of Condition.

CALCULATION.

	ANGLES.	$\frac{1}{3}\varepsilon$.	ANGLES—$\frac{1}{3}\varepsilon$.	LOG. SINES.	CO-EFFICIENTS OF THE CORRECTIONS.
HKC	54° 2′ 22″·86	3″·878	54° 2′ 18″·982	9·9081700·8	15·276 x_{52}
KWC	52·15· 2·07	3·853	52·14·58·217	9·8980031·5	16·303 x_{143}
KC_1W	51·59·52·57	4·142	51·59·48·428	9·8965130·8	16·452 x_{10}
$C_1P_1K_1$	78·40·51·71	3·053	78·40·48·657	9·9914683·6	4·215 x_{42}
P_1PC_1	61· 4·47·83	2·994	61· 4·44·836	9·9421511·2	11·633 x_{43}
PEP_1	51·13·56·10	1·874	51·13·54·226	9·8919190·8	16·910 x_{57}
PHE	26·35·57·19	1·387	26·35·55·803	9·6510267·8	42·048 $(x_{64}-x_{66})$
HCP	70·57·46·03	3·855	70·57·42·175	9·9755700·2	7·266 x_{62}
			Sum..	9·1548216·7	
CHK	52·26· 6·12	3·878	52·26· 2·242	9·8990820·9	16·195 x_{65}
KCW	53· 2·11·23	3·853	53· 2· 7·377	9·9025506·0	15·846 x_{63}
KWC_1	65·19·23·84	4·142	65·19·19·698	9·9584060·0	9·674 x_{142}
C_1KP_1	62·23·20·32	3·053	62·23·17·267	9·9474864·9	11·013 x_{50}
P_1C_1P	37· 5·15·73	2·994	37· 5·12·736	9·7803354·7	27·853 $(x_{11}-x_{13}+x_{22})$
PP_1E	44·48·35·40	1·874	44·48·33·526	9·8480348·0	21·196 x_{39}
PEH	126·26·49·75	1·387	126·26·48·363	9·9054770·3	−15·550 $(x_{54}+x_{56})$
HPC	55· 1· 4·58	3·855	55· 1· 0·725	9·9134540·2	14·734 x_{46}
			Sum..	9·1548265·0	

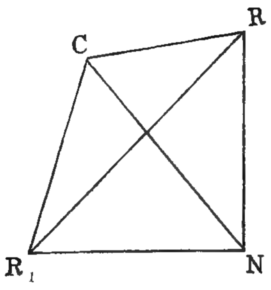
$$(57):\ 0=48{\cdot}3-16{\cdot}452x_{10}+27{\cdot}853x_{11}-27{\cdot}853x_{13}+27{\cdot}853x_{22}+21{\cdot}196x_{39}-4{\cdot}215x_{42}-11{\cdot}633x_{43}$$
$$+14{\cdot}734x_{46}+11{\cdot}013x_{50}-15{\cdot}276x_{52}-15{\cdot}550x_{54}-15{\cdot}550x_{56}-16{\cdot}910x_{57}-7{\cdot}266x_{62}$$
$$+15{\cdot}846x_{63}-42{\cdot}048x_{64}+16{\cdot}195x_{65}+42{\cdot}048x_{66}+9{\cdot}674x_{142}-16{\cdot}303x_{143}$$

In the quadrilateral $CRNR_1$ we have:

$$\frac{RR_1}{RC}\times\frac{RC}{RN}\times\frac{RN}{RR_1}=1$$

Therefore:

$$\frac{\text{Sin. }RCR_1.\ \ \text{Sin. }RNC.\ \ \text{Sin. }RR_1N.}{\text{Sin. }RR_1C.\ \ \text{Sin. }RCN.\ \ \text{Sin. }RNR_1.}=1$$



C...Kapoc Berg.
R...Riebeek's Kasteel.
N...Simon's Berg.
R_1...Rogge Bay.

§ 5.
(C) Triangulation south of the side Ceder Berg—Heeren logement's Berg.

Formation of the Equations of Condition.

CALCULATION.

	ANGLES.	$\frac{1}{3}\,\varepsilon$.	ANGLES—$\frac{1}{3}\varepsilon$.	LOG. SINES.	CO-EFFICIENTS OF THE CORRECTIONS.
RCR_1	98° 13′ 19″·23	1″·938	98° 13′ 17″·292	9·9955135·1	$-\ 3·042\ x_{17}$
RNC	37· 5·45·63	2·014	37· 5·43·616	9·7804214·6	$27·845\ x_{120}$
RR_1N	50·58·58·02	2·207	50·58·55·813	9·8903930·8	$17·061\ x_{108}$
			Sum..	9·6663280·5	
RR_1C	33·33·35·14	1·938	33·33·33·202	9·7425669·4	$31·739\ x_{107}$
RCN	57· 3·45·96	2·014	57· 3·43·946	9·9238972·3	$13·641\ x_{14}$
RNR_1	91·23·47·49	2·207	91·23·45·283	9·9998711·0	$-\ 0·513\ x_{123}$
			Sum..	9·6663352·7	

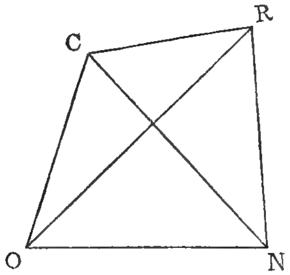
$$(58):\ 0=72·2+13·641x_{14}+3·042x_{17}+31·739x_{107}-17·061x_{108}-27·845x_{120}-0·513x_{123}$$

In the quadrilateral CRNO we have:

$$\frac{CN}{CO}\times\frac{CO}{CR}\times\frac{CR}{CN}=1$$

Therefore:

$$\frac{\text{Sin. CON. Sin. CRO. Sin. CNR.}}{\text{Sin. CNO. Sin. COR. Sin. CRN.}}=1$$



C...Kapoc Berg.
R...Riebeek's Kasteel.
N...Simon's Berg.
O...Royal Observatory.

CALCULATION.

	ANGLES.	$\frac{1}{3}\,\varepsilon$.	ANGLES—$\frac{1}{3}\varepsilon$.	LOG. SINES.	CO-EFFICIENTS OF THE CORRECTIONS.
CON	86° 25′ 25″·01	1″·980	86° 25′ 23″·030	9·9991531·1	$1·316\ x_{111}$
CRO	52· 9·37·84	2·020	52· 9·35·820	9·8974766·1	$16·356\ x_{31}$
CNR	37· 5·45·63	2·014	37· 5·43·616	9·7804214·6	$27·845\ x_{120}$
			Sum..	9·6770511·8	
CNO	57·18· 3·07	1·980	57·18· 1·090	9·9250611·3	$13·517\ x_{122}$
COR	34·30· 6·59	2·020	34·30· 4·570	9·7531420·1	$30·634\ x_{110}$
CRN	85·50·32·38	2·014	85·50·30·366	9·9988552·7	$1·531\ x_{33}$
			Sum..	9·6770584·1	

$$(59):\ 0=72·3-16·356x_{31}+1·531x_{33}+30·634x_{110}-1·316x_{111}-27·845x_{120}+13·517x_{122}$$

§ 5.
(C)
Triangulation south of the side Ceder Berg—Heerenlogement's Berg.

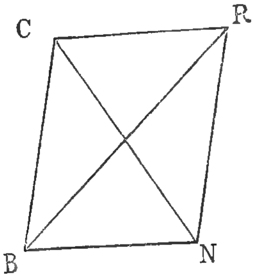
Formation of the Equations of Condition.

In the quadrilateral CRNB we have:

$$\frac{CN}{CB}\times\frac{CB}{CR}\times\frac{CR}{CN}=1$$

Therefore:

$$\frac{\text{Sin. CBN. Sin. CRB. Sin. CNR.}}{\text{Sin. CNB. Sin. CBR. Sin. CRN.}}=1$$



C...Kapoc Berg.
R...Riebeek's Kasteel.
N...Simon's Berg.
B...King's Battery.

CALCULATION.

	ANGLES.	$\frac{1}{3}\varepsilon$.	ANGLES—$\frac{1}{3}\varepsilon$.	LOG. SINES.	CO-EFFICIENTS OF THE CORRECTIONS.
CBN	82° 10′ 10″·20	2″·153	82° 10′ 8″·047	9·9959308·1	2·896 x_{127}
CRB	51· 8· 7·28	2·065	51· 8· 5·215	9·8913278·7	16·968 x_{30}
CNR	37· 5·45·63	2·014	37· 5·43·616	9·7804214·6	27·845 x_{120}
			Sum..	9·6676801·4	
CNB	59· 0· 2·68	2·153	59· 0· 0·527	9·9330662·9	12·651 x_{121}
CBR	32·58·17·12	2·065	32·58·15·055	9·7357682·8	32·459 x_{126}
CRN	85·50·32·38	2·014	85·50·30·366	9·9988552·7	1·531 x_{33}
			Sum..	9·6676898·4	

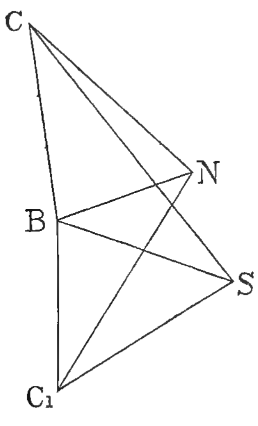
$$(60):\ 0=97\cdot0-16\cdot968x_{30}+1\cdot531x_{33}-27\cdot845x_{120}+12\cdot651x_{121}+32\cdot459x_{126}-2\cdot896x_{127}$$

In the figure $CNBSC_{\text{I}}$ we have:

$$\frac{BC_{\text{I}}}{BS}\times\frac{BS}{BC}\times\frac{BC}{BN}\times\frac{BN}{BC_{\text{I}}}=1$$

Therefore:

$$\frac{\text{Sin. }BSC_{\text{I}}.\ \text{Sin. BCS. Sin. BNC. Sin. }BC_{\text{I}}N.}{\text{Sin. }BC_{\text{I}}S.\ \text{Sin. BSC. Sin. BCN. Sin. }BNC_{\text{I}}.}=1$$



C...Kapoc Berg.
N...Simon's Berg.
S...Sneeuw Kop.
C_{I}...Cape Point.
B...King's Battery.

§ 5. (C) Triangulation south of the side Ceder Berg—Heerenlogement's Berg.

Formation of the Equations of Condition.

CALCULATION.

	ANGLES.	$\frac{1}{3}\varepsilon$.	ANGLES—$\frac{1}{3}\varepsilon$.	LOG. SINES.	CO-EFFICIENTS OF THE CORRECTIONS.
BSC_1	48° 22′ 40″·77	1″·831	48° 22′ 38″·939	9·8736327·8	18·709 x_{134}
BCS	33·30·39·75	2·423	33·30·37·327	9·7420082·4	31·799 x_{18}
BNC	59· 0· 2·68	2·153	59· 0· 0·527	9·9330662·9	12·651 x_{121}
BC_1N	40· 8· 5·82	1·623	40· 8· 4·197	9·8092795·9	24·974 x_{151}
			Sum..	9·3579869·0	
BC_1S	57· 8· 0·04	1·831	57· 7·58·209	9·9242435·9	13·604 x_{152}
BSC	40·37·30·22	2·423	40·37·27·797	9·8136459·1	24·544 x_{137}
BCN	38·49·56·03	2·153	38·49·53·877	9·7972910·7	26·158 $(x_{15}-x_{14})$
BNC_1	41·40·49·30	1·623	41·40·47·677	9·8228010·6	23·648 x_{119}
			Sum..	9·3579816·3	

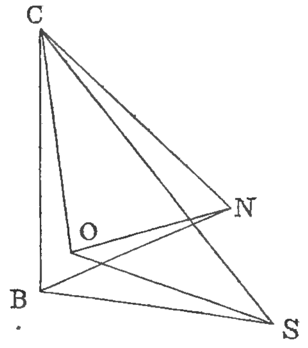
$$(61):\ 0=52\cdot7+26\cdot158_{14}-26\cdot158x_{15}+31\cdot799x_{18}-23\cdot648x_{119}+12\cdot651x_{121}+18\cdot709x_{134}-24\cdot544x_{137}+24\cdot974x_{151}-13\cdot604x_{152}$$

In the figure CNOSB we have:

$$\frac{CN}{CB}\times\frac{CB}{CS}\times\frac{CS}{CO}\times\frac{CO}{CN}=1$$

Therefore:

$$\frac{\text{Sin. CBN Sin. CSB. Sin. COS. Sin. CNO.}}{\text{Sin. CNB. Sin. CBS. Sin. CSO. Sin. CON.}}=1$$



C...Kapoc Berg.
N...Simon's Berg
S...Sneeuw Kop.
O...Royal Observatory.
B...King's Battery.

CALCULATION.

	ANGLES.	$\frac{1}{3}\varepsilon$.	ANGLES—$\frac{1}{3}\varepsilon$.	LOG. SINES.	CO-EFFICIENTS OF THE CORRECTIONS.
CBN	82° 10′ 10″·20	2″·153	82° 10′ 8″·047	9·9959308·1	2·896 x_{127}
CSB	40·37·30·22	2·423	40·37·27·797	9·8136459·1	24·544 x_{137}
COS	111· 3· 1·66	2·200	111· 2·59·460	9·9700065·3	− 8·103 x_{112}
CNO	57·18· 3·07	1·980	57·18· 1·090	9·9250611·3	13·517 x_{122}
			Sum..	9·7046443·8	

§ 5. (C) Triangulation south of the side Ceder Berg—Heerenlogement's Berg.

Formation of the Equations of Condition.

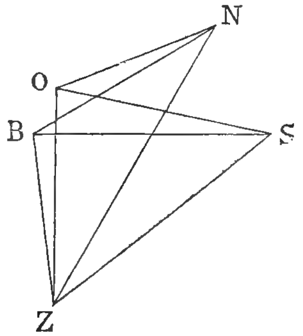
CALCULATION—*continued.*

	ANGLES.	$\frac{1}{3}\epsilon$.	ANGLES—$\frac{1}{3}\epsilon$.	LOG. SINES.	CO-EFFICIENTS OF THE CORRECTIONS.
CNB	59° 0′ 2″·68	2″·153	59° 0′ 0″·527	9·9330662·9	12·651 x_{121}
CBS	105·51·56·65	2·423	105·51·54·227	9·9831336·6	− 5·984 x_{128}
CSO	37·59·42·13	2·200	37·59·39·930	9·7892879·1	26·955 x_{138}
CON	86·25·25·01	1·980	86·25·23·030	9·9991531·1	1·316 x_{111}
			Sum..	9·7046409·7	

$$(62):\ 0=34\cdot1-1\cdot316x_{111}-8\cdot103x_{112}-12\cdot651x_{121}+13\cdot517x_{122}+2\cdot896x_{127}+5\cdot984x_{128}+24\cdot544x_{137}-26\cdot955x_{138}$$

In the figure ONZSB we have:

$$\frac{ZO}{ZN}\times\frac{ZN}{ZB}\times\frac{ZB}{ZS}\times\frac{ZS}{ZO}=1$$



Therefore:

$$\frac{\text{Sin. ZNO. Sin. ZBN. Sin. ZSB. Sin. ZOS.}}{\text{Sin. ZON. Sin. ZNB. Sin. ZBS. Sin. ZSO.}}=1$$

O...Royal Observatory.
N...Simon's Berg.
S...Sneeuw Kop.
Z...Zwart Kop.
B...King's Battery.

CALCULATION.

	ANGLES.	$\frac{1}{3}\epsilon$.	ANGLES—$\frac{1}{3}\epsilon$.	LOG. SINES.	CO-EFFICIENTS OF THE CORRECTIONS.
ZNO	32° 48′ 19″·34	1″·079	32° 48′ 18″·261	9·7338250·6	32·665 x_{125}
ZBN	101·53·15·53	1·099	101·53·14·431	9·9905850·3	− 4·432 x_{130}
ZSB	34·16·13·77	1·274	34·16·12·496	9·7505819·9	30·900 x_{140}
ZOS	79·54·10·43	1·304	79·54· 9·126	9·9932205·5	3·750 x_{114}
			Sum..	9·4682126·3	
ZON	104·31·47·08	1·079	104·31·46·001	9·9858838·0	− 5·457 x_{113}
ZNB	31· 6·19·73	1·099	31· 6·18·631	9·7131634·1	34·896 x_{124}
ZBS	78·11·29·08	1·274	78·11·27·806	9·9907097·0	4·402 x_{133}
ZSO	36·54· 1·86	1·304	36·54· 0·556	9·7784568·5	28·043 x_{141}
			Sum..	9·4682137·6	

$$(63):\ 0=11\cdot3-5\cdot457x_{113}-3\cdot750x_{114}+34\cdot896x_{124}-32\cdot665x_{125}+4\cdot432x_{130}+4\cdot402x_{133}-30\cdot900x_{140}+28\cdot043x_{141}$$

§ 5. (C) Triangulation south of the side Ceder Berg—Heerenlogement's Berg.

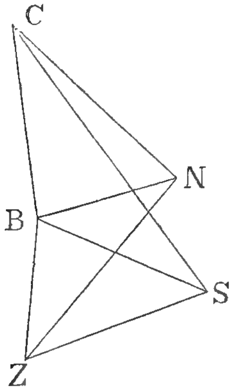
Formation of the Equations of Condition.

In the figure CNBSZ we have:

$$\frac{BZ}{BN}\times\frac{BN}{BC}\times\frac{BC}{BS}\times\frac{BS}{BZ}=1$$

Therefore:

$$\frac{\text{Sin. BNZ. Sin. BCN. Sin. BSC. Sin. BZS.}}{\text{Sin. BZN. Sin. BNC. Sin. BCS. Sin. BSZ.}}=1$$



C...Kapoc Berg.
N...Simon's Berg.
S...Sneeuw Kop.
Z...Zwart Kop.
B...King's Battery.

CALCULATION.

	ANGLES.	$\frac{1}{3}\varepsilon$.	ANGLES$-\frac{1}{3}\varepsilon$.	LOG. SINES.	CO-EFFICIENTS OF THE CORRECTIONS.
BNZ	31° 6′ 19″·73	1″·099	31° 6′ 18″·631	9·7131634·1	34·896 x_{124}
BCN	38·49·56·03	2·153	38·49·53·877	9·7972910·7	26·158 $(x_{15}-x_{14})$
BSC	40·37·30·22	2·423	40·37·27·797	9·8136459·1	24·544 x_{137}
BZS	67·32·22·00	1·274	67·32·20·726	9·9657379·5	8·704 x_{146}
			Sum..	9·2898383·4	
BZN	47· 0·29·13	1·099	47· 0·28·031	9·8641824·6	19·629 x_{145}
BNC	59· 0· 2·68	2·153	59· 0· 0·527	9·9330662·8	12·651 x_{121}
BCS	33·30·39·75	2·423	33·30·37·327	9·7420082·4	31·799 x_{18}
BSZ	34·16·13·77	1·274	34·16·12·496	9·7505819·9	30·900 x_{140}
			Sum..	9·2898389·7	

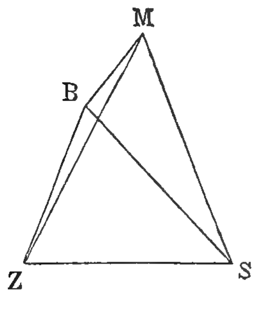
$$(64):\ 0=6\cdot3+26\cdot158x_{14}-26\cdot158x_{15}+31\cdot799x_{18}+12\cdot651x_{121}-34\cdot896x_{124}-24\cdot544x_{137}$$
$$+30\cdot900x_{140}+19\cdot629x_{145}-8\cdot704x_{146}$$

In the quadrilateral MBZS we have:

$$\frac{SM}{SB}\times\frac{SB}{SZ}\times\frac{SZ}{SM}=1$$

Therefore:

$$\frac{\text{Sin. SBM. Sin. SZB. Sin. SMZ.}}{\text{Sin. SMB. Sin. SBZ. Sin. SZM.}}=1$$



M...Meridian Mark, Blaauw Berg.
S...Sneeuw Kop.
Z...Zwart Kop.
B...King's Battery.

§ 5. (C) Triangulation south of the side Ceder Berg—Heerenlogement's Berg.

Formation of the Equations of Condition.

CALCULATION.

	ANGLES.	$\frac{1}{3}\varepsilon$.	ANGLES—$\frac{1}{3}\varepsilon$.	LOG. SINES.	CO-EFFICIENTS OF THE CORRECTIONS.
SBM	94° 53′ 16″·71	0″·965	94° 53′ 15″·745	9·9984178·5	$-$ 1·801 x_{129}
SZB	67·32·22·00	1·274	67·32·20·726	9·9657379·5	8·704 x_{146}
SMZ	57·38·15·53	2·168	57·38·13·362	9·9266891·9	13·344 x_{118}
			Sum..	9·8908449·9	
SMB	61·36·22·89	0·965	61·36·21·925	9·9443341·2	11·382 x_{115}
SBZ	78·11·29·08	1·274	78·11·27·806	9·9907097·0	4·402 x_{133}
SZM	64·35·14·39	2·168	64·35·12·222	9·9558012·2	10·004 x_{147}
			Sum..	9·8908450·4	

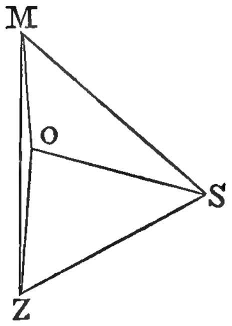
$$(65):\ 0=0{\cdot}5+11{\cdot}382x_{115}-13{\cdot}344x_{118}+1{\cdot}801x_{129}+4{\cdot}402x_{133}-8{\cdot}704x_{146}+10{\cdot}004x_{147}$$

In the figure MOZS we have:

$$\frac{SM}{SO}\times\frac{SO}{SZ}\times\frac{SZ}{SM}=1$$

Therefore:

$$\frac{\text{Sin. SOM. Sin. SZO. Sin. SMZ.}}{\text{Sin. SMO. Sin. SOZ. Sin. SZM.}}=1$$



M...Meridian Mark, Blaauw Berg.
S...Sneeuw Kop.
Z...Zwart Kop.
O...Royal Observatory.

CALCULATION.

	ANGLES.	$\frac{1}{3}\varepsilon$.	ANGLES—$\frac{1}{3}\varepsilon$.	LOG. SINES.	CO-EFFICIENTS OF THE CORRECTIONS.
SOM	103° 38′ 51″·57	0″·828	103° 38′ 50″·742	9·9875617·3	$-$ 5·112 x_{109}
SZO	63·11·52·22	1·304	63·11·50·916	9·9506403·1	10·637 x_{148}
SMZ	57·38·15·53	2·168	57·38·13·362	9·9266891·9	13·344 x_{118}
			Sum..	9·8648912·3	

§ 5.
(C) Triangulation south of the side Ceder Berg—Heerenlogement's Berg.

Formation of the Equations of Condition.

CALCULATION—*continued.*

	ANGLES.	$\frac{1}{3}\varepsilon$.	ANGLES—$\frac{1}{3}\varepsilon$.	LOG. SINES.	CO-EFFICIENTS OF THE CORRECTIONS.
SMO	$55°\ 28'\ 34''.51$	$0''.828$	$55°\ 28'\ 33''.682$	9·9158687·6	$14·484\ x_{117}$
SOZ	79·54·10·43	1·304	79·54· 9·126	9·9932205·5	$3·750\ x_{114}$
SZM	64·35·14·39	2·168	64·35·12·222	9·9558012·2	$10·004\ x_{147}$
			Sum..	9·8648905·3	

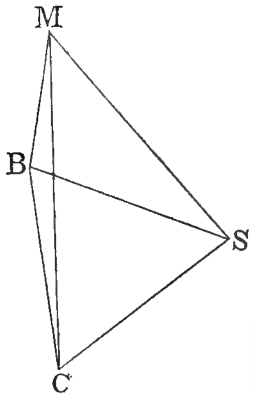
(66): $0=7·0-5·112x_{109}-3·750x_{114}-14·484x_{117}+13·344x_{118}-10·004x_{147}+10·637x_{148}$

In the quadrilateral MBCS we have:

$$\frac{SM}{SC}\times\frac{SC}{SB}\times\frac{SB}{SM}=1$$

Therefore:

$$\frac{\text{Sin. SCM. Sin. SBC. Sin. SMB.}}{\text{Sin. SMC. Sin. SCB. Sin. SBM.}}=1$$



M...Meridian Mark, Blaauw Berg.
S...Sneeuw Kop.
C...Cape Point.
B...King's Battery.

CALCULATION.

	ANGLES.	$\frac{1}{3}\varepsilon$.	ANGLES—$\frac{1}{3}\varepsilon$.	LOG. SINES.	CO-EFFICIENTS OF THE CORRECTIONS.
SCM	$53°\ 33'\ 9''.38$	$2''.638$	$53°\ 33'\ 6''.742$	9·9054693·9	$15·551\ x_{150}$
SBC	74·29·24·33	1·831	74·29·22·499	9·9838886·0	$5·843\ x_{132}$
SMB	61·36·22·89	0·965	61·36·21·925	9·9443341·2	$11·382\ x_{115}$
			Sum..	9·8336921·1	
SMC	54·33·53·43	2·638	54·33·50·792	9·9110322·9	$14·983\ x_{116}$
SCB	57· 8· 0·04	1·831	57· 7·58·209	9·9242435·9	$13·604\ x_{152}$
SBM	94·53·16·71	0·965	94·53·15·745	9·9984178·5	$-\ 1·801\ x_{129}$
			Sum..	9·8336937·3	

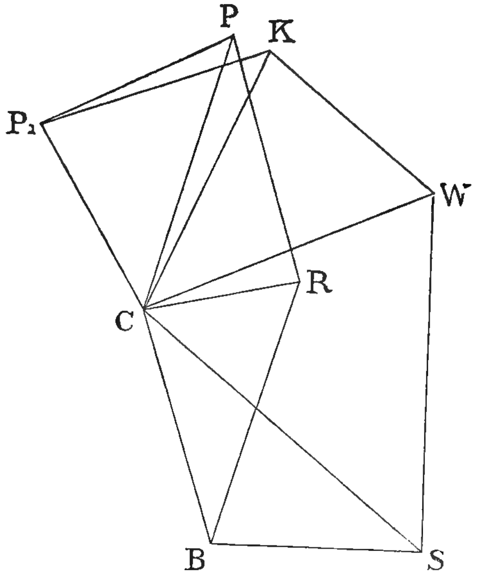
(67): $0=16·2-11·382_{115}+14·983x_{116}-1·801x_{129}-5·843x_{132}-15·551x_{150}+13·604x_{152}$

§ 5.
(C)
Triangulation south of the side Ceder Berg—Heerenlogement's Berg.

Formation of the Equations of Condition.

From the annexed figure we obtain:

$$\frac{CB}{CS}\times\frac{CS}{CW}\times\frac{CW}{CK}\times\frac{CK}{CP_I}\times\frac{CP_I}{CP}\times\frac{CP}{CR}\times\frac{CR}{CB}=1$$



P...Piket Berg.
P_I...Patrys Berg.
C...Kapoc Berg.
B...King's Battery.
S...Sneeuw Kop.
W..Winter Berg.
K...Kapitein's Kloof.
R...Riebeek's Kasteel.

$$\frac{\text{Sin. CSB. Sin. CWS. Sin. CKW. Sin. CP}_I\text{K. Sin. CPP}_I\text{. Sin. CRP. Sin. CBR.}}{\text{Sin. CBS. Sin. CSW. Sin. CWK. Sin. CKP}_I\text{. Sin. CP}_I\text{P. Sin. CPR. Sin. CRB.}}=1$$

CALCULATION.

	ANGLES.	$\frac{1}{3}\varepsilon$.	ANGLES—$\frac{1}{3}\varepsilon$.	LOG. SINES.	CO-EFFICIENTS OF THE CORRECTIONS.
CSB	40°·37′·30″·22	2″·423	40°·37′·27″·797	9·8136459·1	24·544 x_{137}
CWS	55· 9·32·39	5·645	55· 9·26·745	9·9141976·2	14·657 x_{144}
CKW	62·40·54·74	4·142	62·40·50·598	9·9486392·6	10·876 x_{53}
CP_IK	78·40·51·71	3·053	78·40·48·657	9·9914683·6	4·215 x_{42}
CPP_I	61· 4·47·83	2·994	61· 4·44·836	9·9421511·2	11·633 x_{43}
CRP	80·32·39·36	2·671	80·32·36·689	9·9940577·8	3·507 x_{28}
CBR	32·58·17·12	2·065	32·58·15·055	9·7357682·8	32·459 x_{126}
			Sum..	9·3399283·3	
CBS	105·51·56·65	2·423	105·51·54·227	9·9831336·6	− 5·984 x_{128}
CSW	46·56·49·07	5·645	46·56·43·425	9·8637411·5	19·672 x_{136}
CWK	65·19·23·84	4·142	65·19·19·698	9·9584060·0	9·674 x_{142}
CKP_I	62·23·20·32	3·053	62·23·17·267	9·9474864·9	11·013 x_{50}
CP_IP	81·50· 5·81	2·994	81·50· 2·816	9·9955742·4	3·021 $(x_{40}+x_{41})$
CPR	30· 5·58·55	2·671	30· 5·55·879	9·7002652·7	36·324 x_{48}
CRB	51· 8· 7·28	2·065	51· 8· 5·215	9·8913278·6	16·968 x_{30}
			Sum..	9·3399346·7	

(68): $0=63\cdot4-3\cdot507x_{28}+16\cdot968x_{30}+3\cdot021x_{40}+3\cdot021x_{41}-4\cdot215x_{42}-11\cdot633x_{43}+36\cdot324x_{48}$
$+11\cdot013x_{50}-10\cdot876x_{53}-32\cdot459x_{126}-5\cdot984x_{128}+19\cdot672x_{136}-24\cdot544x_{137}+9\cdot674x_{142}-14\cdot657x_{144}$

§ 5.
(D) Triangulation south of the side Ceder Berg—Heeren logement's Berg.

Abstract of the Equations of Condition.

$$
\begin{array}{lll}
 & & '' \\
(1) & 0= & 0\cdot119+x_1+x_3+x_{20} \\
(2) & 0= & 0\cdot188+x_5+x_9+x_{27} \\
(3) & 0= & 0\cdot338+x_2+x_6+x_{24} \\
(4) & 0= & 0\cdot053+x_4+x_{23}+x_{26} \\
(5) & 0= & -0\cdot973+x_7+x_{25}+x_{35} \\
(6) & 0= & -0\cdot033+x_8+x_{29}+x_{38} \\
(7) & 0= & 0\cdot609+x_{22}+x_{27}+x_{29}+x_{37} \\
(8) & 0= & 0\cdot956+x_{13}+x_{28}+x_{48} \\
(9) & 0= & -1\cdot394+x_{11}+x_{34}+x_{41} \\
(10) & 0= & -1\cdot296+x_{36}+x_{40}+x_{49} \\
(11) & 0= & 0\cdot387+x_{11}-x_{13}+x_{22}+x_{40}+x_{41}+x_{43} \\
(12) & 0= & 0\cdot959+x_{39}+x_{44}+x_{57} \\
(13) & 0= & -4\cdot277+x_{45}+x_{54}-x_{55}+x_{56}+x_{59} \\
(14) & 0= & -0\cdot824+x_{55}+x_{58}+x_{69} \\
(15) & 0= & -3\cdot960+x_{47}+x_{54}+x_{56}+x_{64}-x_{66} \\
(16) & 0= & -3\cdot600+x_{46}+x_{47}+x_{54}+x_{61} \\
(17) & 0= & -0\cdot886+x_{46}+x_{62}+x_{66} \\
(18) & 0= & 1\cdot920+x_{12}+x_{42}+x_{50} \\
(19) & 0= & -1\cdot277+x_{10}+x_{53}+x_{142} \\
(20) & 0= & 4\cdot320+x_{51}+x_{63}+x_{143} \\
(21) & 0= & 2\cdot317+x_{52}+x_{60}+x_{65} \\
(22) & 0= & 1\cdot367+x_{17}+x_{32}+x_{107} \\
(23) & 0= & -1\cdot541-x_{32}+x_{33}+x_{108}+x_{123} \\
(24) & 0= & -2\cdot072+x_{14}+x_{33}+x_{120} \\
(25) & 0= & 1\cdot520+x_{16}+x_{31}+x_{110} \\
(26) & 0= & -0\cdot669-x_{14}+x_{16}+x_{111}+x_{122} \\
(27) & 0= & 0\cdot194+x_{15}+x_{30}+x_{126} \\
(28) & 0= & 2\cdot451-x_{14}+x_{15}+x_{121}+x_{127} \\
(29) & 0= & -1\cdot900+x_{19}+x_{112}+x_{138} \\
(30) & 0= & -0\cdot648+x_{18}+x_{128}+x_{137} \\
(31) & 0= & 1\cdot936+x_{21}+x_{136}+x_{144} \\
(32) & 0= & 0\cdot597+x_{114}+x_{141}+x_{148} \\
(33) & 0= & 1\cdot029+x_{133}+x_{140}+x_{146} \\
(34) & 0= & 2\cdot532+x_{113}+x_{125}+x_{149} \\
(35) & 0= & 1\cdot094+x_{124}+x_{130}+x_{145} \\
(36) & 0= & 1\cdot030+x_{119}+x_{131}+x_{151} \\
(37) & 0= & -0\cdot354+x_{132}+x_{134}+x_{152} \\
(38) & 0= & 1\cdot097+x_{109}+x_{117}+x_{139}
\end{array}
$$

§ 5. (D) Triangulation south of the side Ceder Berg—Heerenlogement's Berg.

Abstract of the Equations of Condition.

(39) $0 = 2''\cdot296 + x_{115} + x_{129} - x_{134} + x_{135}$

(40) $0 = 2\cdot777 + x_{118} + x_{139} + x_{141} + x_{147}$

(41) $0 = 1\cdot257 + x_{116} + x_{135} + x_{150}$

(42) $0 = x_{10} - x_{11} + x_{12} - x_{16} + x_{19} + x_{21} - x_{22}$

(43) $0 = x_{15} - x_{16} - x_{18} + x_{19}$

(44) $0 = x_{121} - x_{122} + x_{124} - x_{125}$

(45) $0 = x_{130} - x_{131} + x_{132} - x_{133}$

(46) $0 = x_{127} - x_{128} + x_{130} - x_{133}$

(47) $0 = x_{137} - x_{138} + x_{140} - x_{141}$

(48) $0 = x_{134} - x_{135} + x_{139} - x_{140} + x_{141}$

* (49) $0 = x_{111} - x_{112} + x_{113} - x_{114}$

(50) $0 = x_{145} - x_{146} + x_{148} - x_{149}$

(51) $0 = 21\cdot3 + 1\cdot287x_{5} + 5\cdot914x_{8} + 16\cdot066x_{9} - 20\cdot139x_{22} + 13\cdot760x_{37} - 10\cdot891x_{38}$

(52) $0 = 47\cdot1 - 4\cdot276x_{1} - 4\cdot654x_{2} - 1\cdot287x_{5} - 5\cdot914x_{8} - 31\cdot655x_{20} + 20\cdot139x_{22} - 9\cdot294x_{23}$
$+ 25\cdot553x_{24} - 18\cdot480x_{25} + 17\cdot237x_{26} - 31\cdot394x_{27} + 22\cdot547x_{29} + 21\cdot295x_{35} - 13\cdot760x_{37}$

(53) $0 = 90\cdot9 + 4\cdot904x_{27} - 3\cdot507x_{28} + 4\cdot904x_{29} - 17\cdot638x_{34} - 17\cdot638x_{36} - 13\cdot760x_{37} + 41\cdot389x_{43}$
$+ 36\cdot324x_{48} - 41\cdot389x_{49}$

(54) $0 = 17\cdot2 + 12\cdot073x_{11} - 49\cdot404x_{13} + 49\cdot404x_{22} + 24\cdot374x_{40} - 24\cdot210x_{41} - 41\cdot389x_{43} + 40\cdot666x_{49}$

(55) $0 = 65\cdot1 + 16\cdot249x_{45} - 41\cdot406x_{47} + 9\cdot469x_{58} - 12\cdot207x_{59} + 42\cdot048x_{64} - 42\cdot048x_{66} - 14\cdot456x_{69}$

(56) $0 = 54\cdot3 - 26\cdot406x_{54} - 15\cdot550x_{56} + 29\cdot733x_{61} - 7\cdot266x_{62} - 42\cdot048x_{64} + 57\cdot334x_{66}$

(57) $0 = 48\cdot3 - 16\cdot452x_{10} + 27\cdot853x_{11} - 27\cdot853x_{13} + 27\cdot853x_{22} + 21\cdot196x_{39} - 4\cdot215x_{42} - 11\cdot633x_{43}$
$+ 14\cdot734x_{46} + 11\cdot013x_{50} - 15\cdot276x_{52} - 15\cdot550x_{54} - 15\cdot550x_{56} - 16\cdot910x_{57} - 7\cdot266x_{62}$
$+ 15\cdot846x_{63} - 42\cdot048x_{64} + 16\cdot195x_{65} + 42\cdot048x_{66} + 9\cdot674x_{142} - 16\cdot303x_{143}$

(58) $0 = 72\cdot2 + 13\cdot641x_{14} + 3\cdot042x_{17} + 31\cdot739x_{107} - 17\cdot061x_{108} - 27\cdot845x_{120} - 0\cdot513x_{123}$

(59) $0 = 72\cdot3 - 16\cdot356x_{31} + 1\cdot531x_{33} + 30\cdot634x_{110} - 1\cdot316x_{111} - 27\cdot845x_{120} + 13\cdot517x_{122}$

(60) $0 = 97\cdot0 - 16\cdot968x_{30} + 1\cdot531x_{33} - 27\cdot845x_{120} + 12\cdot651x_{121} + 32\cdot459x_{126} - 2\cdot896x_{127}$

(61) $0 = 52\cdot7 + 26\cdot158x_{14} - 26\cdot158x_{15} + 31\cdot799x_{18} - 23\cdot648x_{119} + 12\cdot651x_{121} + 18\cdot709x_{134}$
$- 24\cdot544x_{137} + 24\cdot974x_{151} - 13\cdot604x_{152}$

(62) $0 = 34\cdot1 - 1\cdot316x_{111} - 8\cdot103x_{112} - 12\cdot651x_{121} + 13\cdot517x_{122} + 2\cdot896x_{127} + 5\cdot984x_{128}$
$+ 24\cdot544x_{137} - 26\cdot955x_{138}$

(63) $0 = 11\cdot3 - 5\cdot457x_{113} - 3\cdot750x_{114} + 34\cdot896x_{124} - 32\cdot665x_{125} + 4\cdot432x_{130} + 4\cdot402x_{133}$
$- 30\cdot900x_{140} + 28\cdot043x_{141}$

(64) $0 = 6\cdot3 + 26\cdot158x_{14} - 26\cdot158x_{15} + 31\cdot799x_{18} + 12\cdot651x_{121} - 34\cdot896_{124} - 24\cdot544_{137}$
$+ 30\cdot900x_{140} + 19\cdot629x_{145} - 8\cdot704x_{146}$

(65) $0 = 0\cdot5 + 11\cdot382x_{115} - 13\cdot344x_{118} + 1\cdot801x_{129} + 4\cdot402x_{133} - 8\cdot704x_{146} + 10\cdot004x_{147}$

(66) $0 = 7\cdot0 - 5\cdot112x_{109} - 3\cdot750x_{114} + 14\cdot484x_{117} + 13\cdot344x_{118} - 10\cdot004x_{147} + 10\cdot637x_{148}$

(67) $0 = 16\cdot2 - 11\cdot382x_{115} + 14\cdot983x_{116} - 1\cdot801x_{129} - 5\cdot843x_{132} - 15\cdot551x_{150} + 13\cdot604x_{152}$

(68) $0 = 63\cdot4 - 3\cdot507x_{28} + 16\cdot968x_{30} + 3\cdot021x_{40} + 3\cdot021x_{41} - 4\cdot215x_{42} - 11\cdot633x_{43} + 36\cdot324x_{48}$
$+ 11\cdot013x_{50} - 10\cdot876x_{53} - 32\cdot459x_{126} - 5\cdot984x_{128} + 19\cdot672x_{136} - 24\cdot544x_{137}$
$+ 9\cdot674x_{142} - 14\cdot657x_{144}$

* Equations (49) and (50) are placed to the right to gain room.

§ 5.
(E) Triangulation south of the side Ceder Berg—Heerenlogement's Berg.

The Corrections x_1, x_2......(multiplied by the weights) in terms of the factors f_1, f_2.

$$4\cdot 2\ x_1 = f_1 - 4\cdot276 f_{52}$$
$$5\cdot 3\ x_2 = f_3 - 4\cdot654 f_{52}$$
$$4\cdot 0\ x_3 = f_1$$
$$3\cdot 4\ x_4 = f_4$$
$$3\cdot 9\ x_5 = f_2 + 1\cdot287 f_{51} - 1\cdot287 f_{52}$$
$$2\cdot 8\ x_6 = f_3$$
$$4\cdot 4\ x_7 = f_5$$
$$3\cdot 0\ x_8 = f_6 + 5\cdot914 f_{51} - 5\cdot914 f_{52}$$
$$4\cdot 9\ x_9 = f_2 + 16\cdot066 f_{51}$$
$$10\cdot 1\ x_{10} = f_{19} + f_{42} - 16\cdot452 f_{57}$$
$$8\cdot 1\ x_{11} = f_9 + f_{11} + f_{42} + 12\cdot073 f_{54} + 27\cdot853 f_{57}$$
$$1\cdot 1\ x_{12} = f_{18} + f_{68}$$
$$4\cdot 1\ x_{13} = f_8 - f_{11} - 49\cdot404 f_{54} - 27\cdot853 f_{57}$$
$$1\cdot74\ x_{14} = f_{24} - f_{26} - f_{28} + 13\cdot641 f_{58} + 26\cdot158 f_{61} + 26\cdot158 f_{64}$$
$$6\cdot 8\ x_{15} = f_{27} + f_{28} + f_{43} - 26\cdot158 f_{61} - 26\cdot158 f_{64}$$
$$5\cdot 9\ x_{16} = f_{25} + f_{26} - f_{42} - f_{43}$$
$$4\cdot 3\ x_{17} = f_{22} + 3\cdot042 f_{58}$$
$$4\cdot 7\ x_{18} = f_{30} - f_{43} + 31\cdot799 f_{61} + 31\cdot799 f_{64}$$
$$4\cdot 2\ x_{19} = f_{29} + f_{42} + f_{43}$$
$$5\cdot 8\ x_{20} = f_1 - 31\cdot655 f_{52}$$
$$7\cdot 5\ x_{21} = f_{31} + f_{42}$$
$$6\cdot 0\ x_{22} = f_7 + f_{11} - f_{42} - 20\cdot139 f_{51} + 20\cdot139 f_{52} + 49\cdot404 f_{54} + 27\cdot853 f_{57}$$
$$4\cdot 4\ x_{23} = f_4 - 9\cdot294 f_{52}$$
$$4\cdot 6\ x_{24} = f_3 + 25\cdot553 f_{52}$$
$$3\cdot 5\ x_{25} = f_5 - 18\cdot480 f_{52}$$
$$3\cdot 6\ x_{26} = f_4 + 17\cdot237 f_{52}$$
$$7\cdot 9\ x_{27} = f_2 + f_7 - 31\cdot394 f_{52} + 4\cdot904 f_{53}$$
$$2\cdot 7\ x_{28} = f_8 - 3\cdot507 f_{53} - 3\cdot507 f_{68}$$
$$7\cdot 5\ x_{29} = f_6 + f_7 + 22\cdot547 f_{52} + 4\cdot904 f_{53}$$
$$4\cdot 8\ x_{30} = f_{27} - 16\cdot968 f_{60} + 16\cdot968 f_{68}$$
$$4\cdot 8\ x_{31} = f_{25} - 16\cdot356 f_{59}$$
$$4\cdot 6\ x_{32} = f_{22} - f_{23}$$
$$3\cdot 6\ x_{33} = f_{23} + f_{24} + 1\cdot531 f_{59} + 1\cdot531 f_{60}$$
$$3\cdot 8\ x_{34} = f_9 - 17\cdot638 f_{53}$$
$$3\cdot 2\ x_{35} = f_5 + 21\cdot295 f_{52}$$
$$3\cdot 6\ x_{36} = f_{10} - 17\cdot638 f_{53}$$
$$5\cdot 7\ x_{37} = f_7 + 13\cdot760 f_{51} - 13\cdot760 f_{52} - 13\cdot760 f_{53}$$
$$4\cdot 6\ x_{38} = f_6 - 10\cdot891 f_{51}$$

§ 5. (E) Triangulation south of the side Ceder Berg—Heerenlogement's Berg.

The Corrections x_1, x_2......(multiplied by the weights) in terms of the factors f_1, f_2.

$4{\cdot}0\ x_{39} = f_{12}+21{\cdot}196f_{57}$
$3{\cdot}6\ x_{40} = f_{10}+f_{11}+24{\cdot}374f_{54}+3{\cdot}021f_{68}$
$7{\cdot}9\ x_{41} = f_9+f_{11}-24{\cdot}210f_{54}+3{\cdot}021f_{68}$
$5{\cdot}1\ x_{42} = f_{18}-4{\cdot}215f_{57}-4{\cdot}215f_{68}$
$14{\cdot}0\ x_{43} = f_{11}+41{\cdot}389f_{53}-41{\cdot}389f_{54}-11{\cdot}633f_{57}-11{\cdot}633f_{68}$
$13{\cdot}0\ x_{44} = f_{12}$
$12{\cdot}6\ x_{45} = f_{13}+16{\cdot}249f_{55}$
$7{\cdot}5\ x_{46} = f_{16}+f_{17}+14{\cdot}734f_{57}$
$5{\cdot}0\ x_{47} = f_{15}+f_{16}-41{\cdot}406f_{55}$
$3{\cdot}9\ x_{48} = f_8+36{\cdot}324f_{53}+36{\cdot}324f_{68}$
$6{\cdot}1\ x_{49} = f_{10}-41{\cdot}389f_{53}+40{\cdot}666f_{54}$
$9{\cdot}5\ x_{50} = f_{18}+11{\cdot}013f_{57}+11{\cdot}013f_{68}$
$9{\cdot}5\ x_{51} = f_{20}$
$9{\cdot}5\ x_{52} = f_{21}-15{\cdot}276f_{57}$
$4{\cdot}75\ x_{53} = f_{19}-10{\cdot}876f_{68}$
$11{\cdot}1\ x_{54} = f_{13}+f_{15}+f_{16}-26{\cdot}406f_{56}-15{\cdot}550f_{57}$
$9{\cdot}3\ x_{55} = -f_{13}+f_{14}$
$10{\cdot}5\ x_{56} = f_{13}+f_{15}-15{\cdot}550f_{56}-15{\cdot}550f_{57}$
$5{\cdot}8\ x_{57} = f_{12}-16{\cdot}910f_{57}$
$10{\cdot}5\ x_{58} = f_{14}+9{\cdot}469f_{55}$
$8{\cdot}2\ x_{59} = f_{13}-12{\cdot}207f_{55}$
$5{\cdot}8\ x_{60} = f_{21}$
$4{\cdot}3\ x_{61} = f_{16}+29{\cdot}733f_{56}$
$3{\cdot}4\ x_{62} = f_{17}-7{\cdot}266f_{56}-7{\cdot}266f_{57}$
$7{\cdot}25\ x_{63} = f_{20}+15{\cdot}846f_{57}$
$9{\cdot}3\ x_{64} = f_{15}+42{\cdot}048f_{55}-42{\cdot}048f_{56}-42{\cdot}048f_{57}$
$4{\cdot}0\ x_{65} = f_{21}+16{\cdot}195f_{57}$
$3{\cdot}0\ x_{66} = -f_{15}+f_{17}-42{\cdot}048f_{55}+57{\cdot}334f_{56}+42{\cdot}048f_{57}$
$5{\cdot}0\ x_{69} = f_{14}-14{\cdot}456f_{55}$
$8{\cdot}2\ x_{107} = f_{22}+31{\cdot}739f_{58}$
$2{\cdot}25\ x_{108} = f_{23}-17{\cdot}061f_{58}$
$5{\cdot}5\ x_{109} = f_{38}-5{\cdot}112f_{66}$
$12{\cdot}7\ x_{110} = f_{25}+30{\cdot}634f_{59}$
$1{\cdot}6\ x_{111} = f_{26}-f_{49}-1{\cdot}316f_{59}-1{\cdot}316f_{62}$
$5{\cdot}3\ x_{112} = f_{29}+f_{49}-8{\cdot}103f_{62}$
$2{\cdot}6\ x_{113} = f_{34}-f_{49}-5{\cdot}457f_{63}$
$2{\cdot}5\ x_{114} = f_{32}+f_{49}-3{\cdot}750f_{63}-3{\cdot}750f_{66}$
$1{\cdot}9\ x_{115} = f_{39}+11{\cdot}382f_{65}-11{\cdot}382f_{67}$

§ 5.
(E)
Triangulation south of the side Ceder Berg—Heerenlogement's Berg.

The Corrections x_1, x_2......(multiplied by the weights) in terms of the factors f_1, f_2.

$5\cdot 2\ x_{116} = f_{41} + 14\cdot 983 f_{67}$
$4\cdot 5\ x_{117} = f_{38} - 14\cdot 484 f_{66}$
$1\cdot 54\ x_{118} = f_{40} - 13\cdot 344 f_{65} + 13\cdot 344 f_{66}$
$10\cdot 4\ x_{119} = f_{36} - 23\cdot 648 f_{61}$
$1\cdot 36\ x_{120} = f_{24} - 27\cdot 845 f_{58} - 27\cdot 845 f_{59} - 27\cdot 845 f_{60}$
$0\cdot 75\ x_{121} = f_{28} + f_{44} + 12\cdot 651 f_{60} + 12\cdot 651 f_{61} - 12\cdot 651 f_{62} + 12\cdot 651 f_{64}$
$1\cdot 37\ x_{122} = f_{26} - f_{44} + 13\cdot 517 f_{59} + 13\cdot 517 f_{62}$
$1\cdot 57\ x_{123} = f_{23} - 0\cdot 513 f_{58}$
$40\cdot 9\ x_{124} = f_{35} + f_{44} + 34\cdot 896 f_{63} - 34\cdot 896 f_{64}$
$14\cdot 2\ x_{125} = f_{34} - f_{44} - 32\cdot 665 f_{63}$
$8\cdot 8\ x_{126} = f_{27} + 32\cdot 459 f_{60} - 32\cdot 459 f_{68}$
$1\cdot 6\ x_{127} = f_{28} - 2\cdot 896 f_{60} + 2\cdot 896 f_{62}$
$14\cdot 4\ x_{128} = f_{30} + 5\cdot 984 f_{62} - 5\cdot 984 f_{68}$
$30\cdot 0\ x_{129} = f_{39} + 1\cdot 801 f_{65} - 1\cdot 801 f_{67}$
$4\cdot 03\ x_{130} = f_{35} - f_{45} + 4\cdot 432 f_{63}$
$3\cdot 9\ x_{131} = f_{36} + f_{45}$
$1\cdot 9\ x_{132} = f_{37} - f_{45} - 5\cdot 843 f_{67}$
$3\cdot 3\ x_{133} = f_{33} + f_{45} + 4\cdot 402 f_{63} + 4\cdot 402 f_{65}$
$16\cdot 9\ x_{134} = f_{37} - f_{39} + f_{48} + 18\cdot 709 f_{61}$
$2\cdot 9\ x_{135} = f_{39} + f_{41} - f_{48}$
$10\cdot 5\ x_{136} = f_{31} + 19\cdot 672 f_{68}$
$14\cdot 2\ x_{137} = f_{30} - f_{47} - 24\cdot 544 f_{61} + 24\cdot 544 f_{62} - 24\cdot 544 f_{64} - 24\cdot 544 f_{68}$
$14\cdot 2\ x_{138} = f_{29} + f_{47} - f_{62}$
$3\cdot 5\ x_{139} = f_{38} + f_{40} + f_{48}$
$12\cdot 0\ x_{140} = f_{33} - f_{47} - f_{48} - 30\cdot 900 f_{63} + 30\cdot 900 f_{64}$
$12\cdot 0\ x_{141} = f_{32} + f_{40} + f_{47} + f_{48} + f_{63}$
$10\cdot 7\ x_{142} = f_{19} + 9\cdot 674 f_{57} + 9\cdot 674 f_{68}$
$10\cdot 7\ x_{143} = f_{20} - 16\cdot 303 f_{57}$
$10\cdot 7\ x_{144} = f_{31} - 14\cdot 657 f_{68}$
$5\cdot 5\ x_{145} = f_{35} + f_{50} + 19\cdot 629 f_{64}$
$5\cdot 5\ x_{146} = f_{33} - f_{50} - 8\cdot 704 f_{64} - 8\cdot 704 f_{65}$
$11\cdot 1\ x_{147} = f_{40} + 10\cdot 004 f_{65} - 10\cdot 004 f_{66}$
$6\cdot 8\ x_{148} = f_{32} + f_{50} + 10\cdot 637 f_{66}$
$30\cdot 0\ x_{149} = f_{34} - f_{50}$
$10\cdot 0\ x_{150} = f_{41} - 15\cdot 551 f_{67}$
$4\cdot 5\ x_{151} = f_{36} + 24\cdot 974 f_{61}$
$4\cdot 9\ x_{152} = f_{37} - 13\ 604 f_{61} + 13\cdot 604 f_{67}$

§ 5. (F) Triangulation south of the side Ceder Berg—Heerenlogement's Berg.

The Corrections x_1, x_2......in terms of the factors f_1, f_2......

$x_1 = 0{\cdot}2381f_1 - 1{\cdot}0181f_{52}$
$x_2 = 0{\cdot}1887f_3 - 0{\cdot}8780f_{52}$
$x_3 = 0{\cdot}2500f_1$
$x_4 = 0{\cdot}2941f_4$
$x_5 = 0{\cdot}2564f_2 + 0{\cdot}3299f_{51} - 0{\cdot}3299f_{52}$
$x_6 = 0{\cdot}3571f_3$
$x_7 = 0{\cdot}2273f_5$
$x_8 = 0{\cdot}3333f_6 + 1{\cdot}9713f_{51} - 1{\cdot}9713f_{52}$
$x_9 = 0{\cdot}2041f_2 + 3{\cdot}2788f_{51}$
$x_{10} = 0{\cdot}0990f_{19} + 0{\cdot}0990f_{42} - 1{\cdot}6289f_{57}$
$x_{11} = 0{\cdot}1235f_9 + 0{\cdot}1235f_{11} - 0{\cdot}1235f_{42} + 1{\cdot}4905f_{54} + 3{\cdot}4387f_{57}$
$x_{12} = 0{\cdot}9091f_{18} + 0{\cdot}9091f_{42}$
$x_{13} = 0{\cdot}2439f_8 - 0{\cdot}2439f_{11} - 12{\cdot}0497f_{54} - 6{\cdot}7934f_{57}$
$x_{14} = 0{\cdot}5747f_{24} - 0{\cdot}5747f_{26} - 0{\cdot}5747f_{28} + 7{\cdot}8395f_{58} + 15{\cdot}0330f_{61} + 15{\cdot}0330f_{64}$
$x_{15} = 0{\cdot}1471f_{27} + 0{\cdot}1471f_{28} + 0{\cdot}1471f_{43} - 3{\cdot}8467f_{61} - 3{\cdot}8467f_{64}$
$x_{16} = 0{\cdot}1695f_{25} + 0{\cdot}1695f_{26} - 0{\cdot}1695f_{42} - 0{\cdot}1695f_{43}$
$x_{17} = 0{\cdot}2326f_{22} + 0{\cdot}7074f_{58}$
$x_{18} = 0{\cdot}2128f_{30} - 0{\cdot}2128f_{43} + 6{\cdot}7657f_{61} + 6{\cdot}7657f_{64}$
$x_{19} = 0{\cdot}2381f_{29} + 0{\cdot}2381f_{42} + 0{\cdot}2381f_{43}$
$x_{20} = 0{\cdot}1724f_1 - 5{\cdot}4577f_{52}$
$x_{21} = 0{\cdot}1333f_{31} + 0{\cdot}1333f_{42}$
$x_{22} = 0{\cdot}1667f_7 + 0{\cdot}1667f_{11} - 0{\cdot}1667f_{42} - 3{\cdot}3565f_{51} + 3{\cdot}3565f_{52} + 8{\cdot}2340f_{54} + 4{\cdot}6422f_{57}$
$x_{23} = 0{\cdot}2273f_4 - 2{\cdot}1122f_{52}$
$x_{24} = 0{\cdot}2174f_3 + 5{\cdot}5549f_{52}$
$x_{25} = 0{\cdot}2857f_5 - 5{\cdot}2800f_{52}$
$x_{26} = 0{\cdot}2778f_4 + 4{\cdot}7882f_{52}$
$x_{27} = 0{\cdot}1266f_2 + 0{\cdot}1266f_7 - 3{\cdot}9739f_{52} + 0{\cdot}6207f_{53}$
$x_{28} = 0{\cdot}3704f_8 - 1{\cdot}2989f_{53} - 1{\cdot}2989f_{68}$
$x_{29} = 0{\cdot}1333f_6 + 0{\cdot}1333f_7 + 3{\cdot}0064f_{52} + 0{\cdot}6538f_{53}$
$x_{30} = 0{\cdot}2083f_{27} - 3{\cdot}5351f_{60} + 3{\cdot}5351f_{68}$
$x_{31} = 0{\cdot}2083f_{25} - 3{\cdot}4075f_{59}$
$x_{32} = 0{\cdot}2174f_{22} - 0{\cdot}2174f_{23}$
$x_{33} = 0{\cdot}2778f_{23} + 0{\cdot}2778f_{24} + 0{\cdot}4252f_{59} + 0{\cdot}4252f_{60}$
$x_{34} = 0{\cdot}2632f_9 - 4{\cdot}6415f_{53}$
$x_{35} = 0{\cdot}3125f_5 + 6{\cdot}6549f_{52}$
$x_{36} = 0{\cdot}2778f_{10} - 4{\cdot}8993f_{53}$
$x_{37} = 0{\cdot}1754f_7 + 2{\cdot}4140f_{51} - 2{\cdot}4140f_{52} - 2{\cdot}4140f_{53}$
$x_{38} = 0{\cdot}2174f_6 - 2{\cdot}3676f_{51}$

§ 5. (F) Triangulation south of the side Ceder Berg—Heerenlogement's Berg.

The Corrections x_1, x_2......in terms of the factors f_1, f_2......

$$x_{39} = 0\cdot2500f_{12}+5\cdot2990f_{57}$$
$$x_{40} = 0\cdot2778f_{10}+0\cdot2778f_{11}+6\cdot7707f_{54}+0\cdot8392f_{68}$$
$$x_{41} = 0\cdot1266f_{9}+0\cdot1266f_{11}-3\cdot0646f_{54}+0\cdot3824f_{68}$$
$$x_{42} = 0\cdot1961f_{18}-0\cdot8265f_{57}-0\cdot8265f_{68}$$
$$x_{43} = 0\cdot0714f_{11}+2\cdot9563f_{53}-2\cdot9563f_{54}-0\cdot8309f_{57}-0\cdot8309f_{68}$$
$$x_{44} = 0\cdot0769f_{12}$$
$$x_{45} = 0\cdot0794f_{13}+1\cdot2896f_{55}$$
$$x_{46} = 0\cdot1333f_{16}+0\cdot1333f_{17}+1\cdot9645f_{57}$$
$$x_{47} = 0\cdot2000f_{15}+0\cdot2000f_{16}-8\cdot2812f_{55}$$
$$x_{48} = 0\cdot2564f_{8}+9\cdot3140f_{53}+9\cdot3140f_{68}$$
$$x_{49} = 0\cdot1639f_{10}-6\cdot7851f_{53}+6\cdot6667f_{54}$$
$$x_{50} = 0\cdot1053f_{18}+1\cdot1593f_{57}+1\cdot1593f_{68}$$
$$x_{51} = 0\cdot1053f_{20}$$
$$x_{52} = 0\cdot1053f_{21}-1\cdot6080f_{57}$$
$$x_{53} = 0\cdot2105f_{19}-2\cdot2897f_{68}$$
$$x_{54} = 0\cdot0901f_{13}+0\cdot0901f_{15}+0\cdot0901f_{16}-2\cdot3790f_{56}-1\cdot4009f_{57}$$
$$x_{55} = -0\cdot1075f_{13}+0\cdot1075f_{14}$$
$$x_{56} = 0\cdot0952f_{13}+0\cdot0952f_{15}-1\cdot4809f_{56}-1\cdot4809f_{57}$$
$$x_{57} = 0\cdot1724f_{12}-2\cdot9155f_{57}$$
$$x_{58} = 0\cdot0952f_{14}+0\cdot9018f_{55}$$
$$x_{59} = 0\cdot1220f_{13}-1\cdot4886f_{55}$$
$$x_{60} = 0\cdot1724f_{21}$$
$$x_{61} = 0\cdot2326f_{16}+6\cdot9147f_{56}$$
$$x_{62} = 0\cdot2941f_{17}-2\cdot1370f_{56}-2\cdot1370f_{57}$$
$$x_{63} = 0\cdot1379f_{20}+2\cdot1856f_{57}$$
$$x_{64} = 0\cdot1075f_{15}+4\cdot5214f_{55}-4\cdot5214f_{56}-4\cdot5214f_{57}$$
$$x_{65} = 0\cdot2500f_{21}+4\cdot0488f_{57}$$
$$x_{66} = -0\cdot3333f_{15}+0\cdot3333f_{17}-14\cdot0160f_{55}+19\cdot1113f_{56}+14\cdot0160f_{57}$$
$$x_{69} = 0\cdot2000f_{14}-2\cdot8912f_{55}$$
$$x_{107} = 0\cdot1220f_{22}+3\cdot8707f_{58}$$
$$x_{108} = 0\cdot4444f_{23}-7\cdot5828f_{58}$$
$$x_{109} = 0\cdot1818f_{38}-0\cdot9295f_{66}$$
$$x_{110} = 0\cdot0787f_{25}+2\cdot4122f_{59}$$
$$x_{111} = 0\cdot6250f_{26}-0\cdot6250f_{49}-0\cdot8226f_{59}-0\cdot8226f_{62}$$
$$x_{112} = 0\cdot1887f_{29}+0\cdot1887f_{49}-1\cdot5289f_{62}$$
$$x_{113} = 0\cdot3846f_{34}-0\cdot3846f_{49}-2\cdot0988f_{63}$$
$$x_{114} = 0\cdot4000f_{32}+0\cdot4000f_{49}-1\cdot4998f_{63}-1\cdot4998f_{66}$$
$$x_{115} = 0\cdot5263f_{39}+5\cdot9903f_{65}-5\cdot9903f_{67}$$

§ 5. (F) Triangulation south of the side Ceder Berg—Heerenlogement's Berg.

The Corrections x_1, x_2......in terms of the factors f_1, f_2......

$x_{116}= 0\cdot1923f_{41}+2\cdot8814f_{67}$

$x_{117}= 0\cdot2222f_{38}-3\cdot2186f_{66}$

$x_{118}= 0\cdot6494f_{40}-8\cdot6646f_{65}+8\cdot6646f_{66}$

$x_{119}= 0\cdot0962f_{36}-2\cdot2739f_{61}$

$x_{120}= 0\cdot7353f_{24}-20\cdot4740f_{58}-20\cdot4740f_{59}-20\cdot4740f_{60}$

$x_{121}= 1\cdot3333f_{28}+1\cdot3333f_{44}+16\cdot8680f_{60}+16\cdot8680f_{61}-16\cdot8680f_{62}+16\cdot8680f_{64}$

$x_{122}= 0\cdot7299f_{26}-0\cdot7299f_{44}+9\cdot8664f_{59}+9\cdot8664f_{62}$

$x_{123}= 0\cdot6369f_{23}-0\cdot3268f_{58}$

$x_{124}= 0\cdot0244f_{35}+0\cdot0244f_{44}+0\cdot8532f_{63}-0\cdot8532f_{64}$

$x_{125}= 0\cdot0704f_{34}+0\cdot0704f_{44}-2\cdot3003f_{63}$

$x_{126}= 0\cdot1136f_{27}+3\cdot6885f_{60}-3\cdot6885f_{68}$

$x_{127}= 0\cdot6250f_{28}-1\cdot8100f_{60}+1\cdot8100f_{62}$

$x_{128}= 0\cdot0694f_{30}+0\cdot4156f_{62}-0\cdot4156f_{68}$

$x_{129}= 0\cdot0333f_{39}+0\cdot0600f_{65}-0\cdot0600f_{67}$

$x_{130}= 0\cdot2481f_{35}-0\cdot2481f_{45}+1\cdot0997f_{63}$

$x_{131}= 0\cdot2564f_{36}+0\cdot2564f_{45}$

$x_{132}= 0\cdot5263f_{37}-0\cdot5263f_{45}-3\cdot0754f_{67}$

$x_{133}= 0\cdot3030f_{33}+0\cdot3030f_{45}+1\cdot3340f_{63}+1\cdot3340f_{65}$

$x_{134}= 0\cdot0592f_{37}-0\cdot0592f_{39}+0\cdot0592f_{48}+1\cdot1070f_{61}$

$x_{135}= 0\cdot3448f_{39}+0\cdot3448f_{41}-0\cdot3448f_{48}$

$x_{136}= 0\cdot0952f_{31}+1\cdot8735f_{68}$

$x_{137}= 0\cdot0704f_{30}-0\cdot0704f_{47}-1\cdot7285f_{61}+1\cdot7285f_{62}-1\cdot7285f_{64}-1\cdot7285f_{68}$

$x_{138}= 0\cdot0704f_{29}+0\cdot0704f_{47}-1\cdot8980f_{62}$

$x_{139}= 0\cdot2857f_{38}+0\cdot2857f_{40}+0\cdot2857f_{48}$

$x_{140}= 0\cdot0833f_{33}-0\cdot0833f_{47}-0\cdot0833f_{48}-2\cdot5750f_{63}+2\cdot5750f_{64}$

$x_{141}= 0\cdot0833f_{32}+0\cdot0833f_{40}+0\cdot0833f_{47}+0\cdot0833f_{48}+2\cdot3369f_{63}$

$x_{142}= 0\cdot0935f_{19}+0\cdot9042f_{57}+0\cdot9042f_{68}$

$x_{143}= 0\cdot0935f_{20}-1\cdot5237f_{57}$

$x_{144}= 0\cdot0935f_{31}-1\cdot3698f_{68}$

$x_{145}= 0\cdot1818f_{35}+0\cdot1818f_{50}+3\cdot5689f_{64}$

$x_{146}= 0\cdot1818f_{33}-0\cdot1818f_{50}-1\cdot5826f_{64}-1\cdot5826f_{65}$

$x_{147}= 0\cdot0901f_{40}+0\cdot9012f_{65}-0\cdot9012f_{66}$

$x_{148}= 0\cdot1471f_{32}+0\cdot1471f_{50}+1\cdot5643f_{66}$

$x_{149}= 0\cdot3333f_{34}-0\cdot3333f_{50}$

$x_{150}= 0\cdot1000f_{41}-1\cdot5551f_{67}$

$x_{151}= 0\cdot2222f_{36}+5\cdot5497f_{61}$

$x_{152}= 0\cdot2041f_{37}-2\cdot7763f_{61}+2\cdot7763f_{67}$

§ 5.
(G)
Triangulation south of the side Ceder Berg—Heerenlogement's Berg.

Final Equations for determining the values of the factors f_1, f_2……

$$(1)\quad 0 = \overset{''}{0\cdot119}+\cdot6605f_1-6\cdot4758f_{52}$$
$$(2)\quad 0 = 0\cdot188+\cdot5871f_2+\cdot1266f_7+3\cdot6087f_{51}-4\cdot3038f_{52}+\cdot6207f_{53}$$
$$(3)\quad 0 = 0\cdot338+\cdot7632f_3+4\cdot6769f_{52}$$
$$(4)\quad 0 = 0\cdot053+\cdot7992f_4+2\cdot6760f_{52}$$
$$(5)\quad 0 = -0\cdot973+\cdot8255f_5+1\cdot3749f_{52}$$
$$(6)\quad 0 = -0\cdot033+\cdot6840f_6+\cdot1333f_7-\cdot3963f_{51}+1\cdot0351f_{52}+\cdot6538f_{53}$$
$$(7)\quad 0 = 0\cdot609+\cdot1266f_2+\cdot1333f_6+\cdot6020f_7+\cdot1667f_{11}-\cdot1667f_{42}-\cdot9425f_{51}-\cdot0250f_{52}$$
$$-1\cdot1395f_{53}+8\cdot2340f_{54}+4\cdot6422f_{57}$$
$$(8)\quad 0 = 0\cdot956+\cdot8707f_8-\cdot2439f_{11}+8\cdot0151f_{53}-12\cdot0497f_{54}-6\cdot7934f_{57}+8\cdot0151f_{68}$$
$$(9)\quad 0 = -1\cdot394+\cdot5133f_9+\cdot2501f_{11}-\cdot1235f_{42}-4\cdot6415f_{53}-1\cdot5741f_{54}+3\cdot4387f_{57}+\cdot3824f_{68}$$
$$(10)\quad 0 = -1\cdot296+\cdot7195f_{10}+\cdot2778f_{11}-11\cdot6844f_{53}+13\cdot4374f_{54}+\cdot8392f_{68}$$
$$(11)\quad 0 = 0\cdot387+\cdot1667f_7-\cdot2439f_8+\cdot2501f_9+\cdot2778f_{10}+1\cdot0099f_{11}-\cdot2902f_{42}-3\cdot3565f_{51}$$
$$+3\cdot3565f_{52}+2\cdot9563f_{53}+22\cdot5240f_{54}+14\cdot0434f_{57}+\cdot3907f_{68}$$
$$(12)\quad 0 = 0\cdot959+\cdot4993f_{12}+2\cdot3835f_{57}$$
$$(13)\quad 0 = -4\cdot277+\cdot4942f_{13}-\cdot1075f_{14}+1853f_{15}+\cdot0901f_{16}-\cdot1990f_{55}-3\cdot8599f_{56}-2\cdot8818f_{57}$$
$$(14)\quad 0 = -0\cdot824-\cdot1075f_{13}+\cdot4027f_{14}-1\cdot9894f_{55}$$
$$(15)\quad 0 = -3\cdot960+\cdot1853f_{13}+\cdot8261f_{15}+\cdot2901f_{16}-\cdot3333f_{17}+10\cdot2562f_{55}-27\cdot4926f_{56}-21\cdot4192f_{57}$$
$$(16)\quad 0 = -3\cdot600+\cdot0901f_{13}+\cdot2901f_{15}+\cdot6560f_{16}+\cdot1333f_{17}-8\cdot2812f_{55}+4\cdot5357f_{56}+\cdot5636f_{57}$$
$$(17)\quad 0 = -0\cdot886-\cdot3333f_{15}+\cdot1333f_{16}+\cdot7607f_{17}-14\cdot0160f_{55}+16\cdot9743f_{56}+13\cdot8435f_{57}$$
$$(18)\quad 0 = +1\cdot920+1\cdot2105f_{18}+\cdot9091f_{42}+\cdot3328f_{57}+\cdot3328f_{68}$$
$$(19)\quad 0 = -1\cdot277+\cdot4030f_{19}+\cdot0990f_{42}-\cdot7247f_{57}-1\cdot3855f_{68}$$
$$(20)\quad 0 = 4\cdot320+\cdot3367f_{20}+\cdot6619f_{57}$$
$$(21)\quad 0 = 2\cdot317+\cdot5277f_{21}+2\cdot4408f_{57}$$
$$(22)\quad 0 = 1\cdot367+\cdot5720f_{22}-\cdot2174f_{23}+4\cdot5781f_{58}$$
$$(23)\quad 0 = -1\cdot541-\cdot2174f_{22}+1\cdot5765f_{23}+\cdot2778f_{24}-7\cdot9096f_{58}+\cdot4252f_{59}+\cdot4252f_{60}$$
$$(24)\quad 0 = -2\cdot072+\cdot2778f_{23}+1\cdot5878f_{24}-\cdot5747f_{26}-\cdot5747f_{28}-12\cdot6345f_{58}-20\cdot0488f_{59}-20\cdot0488f_{60}$$
$$+15\cdot0330f_{61}+15\cdot0330f_{64}$$
$$(25)\quad 0 = 1\cdot520+\cdot4565f_{25}+\cdot1695f_{26}-\cdot1695f_{42}-\cdot1695f_{43}-\cdot9953f_{59}$$
$$(26)\quad 0 = -0\cdot669-\cdot5747f_{24}+\cdot1695f_{25}+2\cdot0991f_{26}+\cdot5747f_{28}-\cdot1695f_{42}-\cdot1695f_{43}-\cdot7299f_{44}$$
$$-\cdot6250f_{49}-7\cdot8395f_{58}+9\cdot0438f_{59}-15\cdot0330f_{61}+9\cdot0438f_{62}-15\cdot0330f_{64}$$
$$(27)\quad 0 = 0\cdot194+\cdot4690f_{27}+\cdot1471f_{28}+\cdot1471f_{43}+\cdot1534f_{60}-3\cdot8467f_{61}-3\cdot8467f_{64}-\cdot1534f_{68}$$
$$(28)\quad 0 = 2\cdot451-\cdot5747f_{24}+\cdot5747f_{26}+\cdot1471f_{27}+2\cdot6801f_{28}+\cdot1471f_{43}+1\cdot3333f_{44}-7\cdot8395f_{58}$$
$$+15\cdot0580f_{60}-2\cdot0117f_{61}-15\cdot0580f_{62}-2\cdot0117f_{64}$$
$$(29)\quad 0 = -1\cdot900+\cdot4972f_{29}+\cdot2381f_{42}+\cdot2381f_{43}+\cdot0704f_{47}+\cdot1887f_{49}-3\cdot4269f_{62}$$
$$(30)\quad 0 = -0\cdot648+\cdot3526f_{30}-\cdot2128f_{43}-\cdot0704f_{47}+5\cdot0372f_{61}+2\cdot1441f_{62}+5\cdot0372f_{64}-2\cdot1441f_{68}$$
$$(31)\quad 0 = 1\cdot936+\cdot3220f_{31}+\cdot1333f_{42}+\cdot5037f_{68}$$
$$(32)\quad 0 = 0\cdot597+\cdot6304f_{32}+\cdot0833f_{40}+\cdot0833f_{47}+\cdot0833f_{48}+\cdot4000f_{49}+\cdot1471f_{50}+\cdot8371f_{63}$$
$$+\cdot0645f_{66}$$

§ 5. (G) Triangulation south of the side Ceder Berg—Heerenlogement's Berg.

Final Equations for determining the values of the factors f_1, f_2.......

(33) $0 = 1{\cdot}029+{\cdot}5681f_{33}+{\cdot}3030f_{45}-{\cdot}0833f_{47}-{\cdot}0833f_{48}-{\cdot}1818f_{50}-1{\cdot}2410f_{63}+{\cdot}9924f_{64}-{\cdot}2486f_{65}$

(34) $0 = 2{\cdot}532+{\cdot}7883f_{34}-{\cdot}0704f_{44}-{\cdot}3846f_{49}-{\cdot}3333f_{50}-4{\cdot}3991f_{63}$

(35) $0 = 1{\cdot}094+{\cdot}4543f_{35}+{\cdot}0244f_{44}-{\cdot}2481f_{45}+{\cdot}1818f_{50}+1{\cdot}9529f_{63}+2{\cdot}7157f_{64}$

(36) $0 = 1{\cdot}030+{\cdot}5748f_{36}+{\cdot}2564f_{45}+3{\cdot}2758f_{61}$

(37) $0 = -0{\cdot}354+{\cdot}7896f_{37}-{\cdot}0592f_{39}-{\cdot}5263f_{45}+{\cdot}0592f_{48}-1{\cdot}6693f_{61}-{\cdot}2991f_{67}$

(38) $0 = 1{\cdot}097+{\cdot}6897f_{38}+{\cdot}2857f_{40}+{\cdot}2857f_{48}-4{\cdot}1481f_{66}$

(39) $0 = 2{\cdot}296-{\cdot}0592f_{37}+{\cdot}9636f_{39}+{\cdot}3448f_{41}-{\cdot}4040f_{48}-1{\cdot}1070f_{61}+6{\cdot}0503f_{65}-6{\cdot}0503f_{67}$

(40) $0 = 2{\cdot}777+{\cdot}0833f_{32}+{\cdot}2857f_{38}+1{\cdot}1085f_{40}+{\cdot}0833f_{47}+{\cdot}3690f_{48}+2{\cdot}3369f_{63}-7{\cdot}7634f_{65}+7{\cdot}7634f_{66}$

(41) $0 = 1{\cdot}257+{\cdot}3448f_{39}+{\cdot}6371f_{41}-{\cdot}3448f_{48}+1{\cdot}3263f_{67}$

(42) $0 = 0{\cdot}000-{\cdot}1667f_{7}-{\cdot}1235f_{9}-{\cdot}2902f_{11}+{\cdot}9091f_{18}+{\cdot}0990f_{19}-{\cdot}1695f_{25}-{\cdot}1695f_{26}+{\cdot}2381f_{29}-{\cdot}1335f_{31}+1{\cdot}8392f_{42}+{\cdot}4076f_{43}+3{\cdot}3565f_{51}-3{\cdot}3565f_{52}-9{\cdot}7245f_{54}-9{\cdot}7098f_{57}$

(43) $0 = 0{\cdot}000-{\cdot}1695f_{25}-{\cdot}1695f_{26}+{\cdot}1471f_{27}+{\cdot}1471f_{28}+{\cdot}2381f_{29}-{\cdot}2128f_{30}+{\cdot}4076f_{42}+{\cdot}7675f_{43}-10{\cdot}6124f_{61}-10{\cdot}6124f_{64}$

(44) $0 = 0{\cdot}000-{\cdot}7299f_{26}+1{\cdot}3333f_{28}-{\cdot}0704f_{34}+{\cdot}0244f_{35}+2{\cdot}1580f_{44}-9{\cdot}8664f_{59}+16{\cdot}8680f_{60}+16{\cdot}8680f_{61}-26{\cdot}7344f_{62}+3{\cdot}1535f_{63}+16{\cdot}0148f_{64}$

(45) $0 = 0{\cdot}000+{\cdot}3030f_{33}-{\cdot}2481f_{35}+{\cdot}2564f_{36}-{\cdot}5263f_{37}+1{\cdot}3338f_{45}+{\cdot}2343f_{63}+1{\cdot}3340f_{65}+3{\cdot}0754f_{67}$

(47) $0 = 0{\cdot}000+{\cdot}0704f_{29}-{\cdot}0704f_{30}+{\cdot}0833f_{32}-{\cdot}0833f_{33}+{\cdot}0833f_{40}+{\cdot}3074f_{47}+{\cdot}1666f_{48}+1{\cdot}7285f_{61}-3{\cdot}6265f_{62}+4{\cdot}9119f_{63}+1{\cdot}7285f_{68}$

(48) $0 = 0{\cdot}000+{\cdot}0833f_{32}-{\cdot}0833f_{33}+{\cdot}0592f_{37}+{\cdot}2857f_{38}-{\cdot}4040f_{39}+{\cdot}3690f_{40}-{\cdot}3448f_{41}+{\cdot}1666f_{47}+{\cdot}8563f_{48}+1{\cdot}1070f_{61}+4{\cdot}9119f_{63}-2{\cdot}5750f_{64}$

(49) $0 = 0{\cdot}000-{\cdot}6250f_{26}+{\cdot}1887f_{29}+{\cdot}4000f_{32}-{\cdot}3846f_{34}+1{\cdot}5983f_{49}+{\cdot}8226f_{59}-{\cdot}7063f_{62}+{\cdot}5990f_{63}-1{\cdot}4998f_{66}$

(50) $0 = 0{\cdot}000+{\cdot}1471f_{32}-{\cdot}1818f_{33}-{\cdot}3333f_{34}+{\cdot}1818f_{35}+{\cdot}8440f_{50}+5{\cdot}1515f_{64}+1{\cdot}5826f_{65}+1{\cdot}5643f_{66}$

(51) $0 = 21{\cdot}3+3{\cdot}6087f_{2}-{\cdot}3963f_{6}-{\cdot}9425f_{7}-3{\cdot}3565f_{11}+3{\cdot}3565f_{42}+191{\cdot}3593f_{51}-112{\cdot}8969f_{52}-33{\cdot}2171f_{53}-165{\cdot}826f_{54}-93{\cdot}4890f_{57}$

(52) $0 = 47{\cdot}1-6{\cdot}4758f_{1}-4{\cdot}3038f_{2}+4{\cdot}6769f_{3}+2{\cdot}6760f_{4}+1{\cdot}3749f_{5}+1{\cdot}0351f_{6}-{\cdot}0250f_{7}+3{\cdot}3565f_{11}-3{\cdot}3565f_{42}-112{\cdot}8969f_{51}+970{\cdot}038f_{52}+28{\cdot}4720f_{53}+165{\cdot}828f_{54}+93{\cdot}4889f_{57}$

(53) $0 = 90{\cdot}9+{\cdot}6207f_{2}+{\cdot}6538f_{6}-1{\cdot}1395f_{7}+8{\cdot}0151f_{8}-4{\cdot}6415f_{9}-11{\cdot}6844f_{10}+2{\cdot}9563f_{11}-33{\cdot}2171f_{51}+28{\cdot}4720f_{52}+953{\cdot}807f_{53}-398{\cdot}276f_{54}-34{\cdot}3910f_{57}+308{\cdot}487f_{68}$

(54) $0 = 17{\cdot}2+8{\cdot}2340f_{7}-12{\cdot}0497f_{8}-1{\cdot}5741f_{9}+13{\cdot}4374f_{10}+22{\cdot}524f_{11}-9{\cdot}7245f_{42}-165{\cdot}826f_{51}+165{\cdot}828f_{52}-398{\cdot}276f_{53}+1652{\cdot}768f_{54}+640{\cdot}871f_{57}+45{\cdot}5878f_{68}$

§ 5.
(G)
Triangulation south of the side Ceder Berg—Heerenlogement's Berg.

Final Equations for determining the values of the factors f_1, f_2......

$$(55)\quad 0 = \begin{aligned}[t] &65\cdot1-\cdot1990f_{13}-1\cdot9894f_{14}+10\cdot2562f_{15}-8\cdot2812f_{16}-14\cdot0160f_{17}+1211\cdot8076f_{55}\\ &-993\cdot704f_{56}-779\cdot456f_{57}\end{aligned}$$

$$(56)\quad 0 = \begin{aligned}[t] &54\cdot3-3\cdot8599f_{13}-27\cdot4926f_{15}+4\cdot5357f_{16}+16\cdot9743f_{17}-993\cdot704f_{55}+1592\cdot809f_{56}\\ &+1069\cdot253f_{57}\end{aligned}$$

$$(57)\quad 0 = \begin{aligned}[t] &48\cdot3+4\cdot6422f_{7}-6\cdot7934f_{8}+3\cdot4387f_{9}+14\cdot0434f_{11}+2\cdot3835f_{12}-2\cdot8818f_{13}-21\cdot4192f_{15}\\ &+0\cdot5636f_{16}+13\cdot8435f_{17}+\cdot3328f_{18}-\cdot7247f_{19}+\cdot6619f_{20}+2\cdot4408f_{21}-9\cdot7098f_{42}\\ &-93\cdot489f_{51}+93\cdot4889f_{52}-34\cdot3910f_{53}+640\cdot871f_{54}-779\cdot456f_{55}+1069\cdot253f_{56}\\ &+1655\cdot721f_{57}+34\cdot6633f_{68}\end{aligned}$$

$$(58)\quad 0 = \begin{aligned}[t] &72\cdot2+4\cdot5781f_{22}-7\cdot9096f_{23}-12\cdot6345f_{24}-7\cdot8395f_{26}-7\cdot8395f_{28}+931\cdot571f_{58}\\ &+570\cdot085f_{59}+570\cdot085f_{60}+205\cdot065f_{61}+205\cdot065f_{64}\end{aligned}$$

$$(59)\quad 0 = \begin{aligned}[t] &72\cdot3+\cdot4252f_{23}-20\cdot0488f_{24}-\cdot9953f_{25}+9\cdot0438f_{26}-9\cdot8664f_{44}+\cdot8226f_{49}+570\cdot085f_{58}\\ &+834\cdot810f_{59}+570\cdot736f_{60}+134\cdot4467f_{62}\end{aligned}$$

$$(60)\quad 0 = \begin{aligned}[t] &97\cdot0+\cdot4252f_{23}-20\cdot0488f_{24}+\cdot1534f_{27}+15\cdot0580f_{28}+16\cdot868f_{44}+570\cdot085f_{58}\\ &+570\cdot736f_{59}+969\cdot089f_{60}+213\cdot403f_{61}-218\cdot6448f_{62}+213\cdot403f_{64}-179\cdot7086f_{68}\end{aligned}$$

$$(61)\quad 0 = \begin{aligned}[t] &52\cdot7+15\cdot033f_{24}-15\cdot033f_{26}-3\cdot8467f_{27}-2\cdot0117f_{28}+5\cdot0372f_{30}+3\cdot2758f_{36}-1\cdot6693f_{37}\\ &-1\cdot1070f_{39}-10\cdot6124f_{43}+16\cdot868f_{44}+1\cdot7285f_{47}+1\cdot1070f_{48}+205\cdot065f_{58}\\ &+213\cdot403f_{60}+1215\cdot670f_{61}-255\cdot8267f_{62}+964\cdot821f_{64}-37\cdot7694f_{67}+42\cdot4238f_{68}\end{aligned}$$

$$(62)\quad 0 = \begin{aligned}[t] &34\cdot1+9\cdot0438f_{26}-15\cdot058f_{28}-3\cdot4269f_{29}+2\cdot1441f_{30}-26\cdot7344f_{44}-3\cdot6265f_{47}-\cdot7063f_{49}\\ &+134\cdot4467f_{59}-218\cdot6448f_{60}-255\cdot8268f_{61}+461\cdot559f_{62}-255\cdot8268f_{64}-44\cdot9105f_{68}\end{aligned}$$

$$(63)\quad 0 = \begin{aligned}[t] &11\cdot3+\cdot8371f_{32}-1\cdot2410f_{33}-4\cdot3991f_{34}+1\cdot9529f_{35}+2\cdot3369f_{40}+3\cdot1535f_{44}+\cdot2343f_{45}\\ &+4\cdot9119f_{47}+4\cdot9119f_{48}+\cdot5990f_{49}+277\cdot838f_{63}-109\cdot3425f_{64}+5\cdot8723f_{65}\\ &+5\cdot6236f_{66}\end{aligned}$$

$$(64)\quad 0 = \begin{aligned}[t] &6\cdot3+15\cdot0330f_{24}-15\cdot0330f_{26}-3\cdot8467f_{27}-2\cdot0117f_{28}+5\cdot0372f_{30}+\cdot9924f_{33}+2\cdot7157f_{35}\\ &-10\cdot6124f_{43}+16\cdot0148f_{44}-\cdot8465f_{47}-2\cdot5750f_{48}+5\cdot1515f_{50}+205\cdot065f_{58}\\ &+213\cdot403f_{60}+964\cdot821f_{61}-255\cdot8268f_{62}-109\cdot3425f_{63}+1157\cdot994f_{64}+13\cdot7759f_{65}\\ &+42\cdot4238f_{68}\end{aligned}$$

$$(65)\quad 0 = \begin{aligned}[t] &0\cdot5-\cdot2486f_{33}+6\cdot0503f_{39}-7\cdot7634f_{40}+1\cdot3340f_{45}+1\cdot5826f_{50}+5\cdot8723f_{63}+13\cdot7759f_{64}\\ &+212\cdot567f_{65}-124\cdot6323f_{66}-68\cdot2866f_{67}\end{aligned}$$

$$(66)\quad 0 = \begin{aligned}[t] &7\cdot0+\cdot0645f_{32}-4\cdot1481f_{38}+7\cdot7634f_{40}-1\cdot4998f_{49}+1\cdot5643f_{50}+5\cdot6236f_{63}-124\cdot6323f_{65}\\ &+198\cdot2644f_{66}\end{aligned}$$

$$(67)\quad 0 = \begin{aligned}[t] &16\cdot2-\cdot2991f_{37}-6\cdot0503f_{39}+1\cdot3263f_{41}+3\cdot0754f_{45}-37\cdot7694f_{61}-68\cdot2866f_{65}\\ &+191\cdot3811f_{67}\end{aligned}$$

$$(68)\quad 0 = \begin{aligned}[t] &63\cdot4+8\cdot0151f_{8}+\cdot3824f_{9}+\cdot8392f_{10}+\cdot3907f_{11}+\cdot3328f_{18}-1\cdot3855f_{19}-\cdot1534f_{27}\\ &-2\cdot1441f_{30}+\cdot5037f_{31}+1\cdot7285f_{47}+308\cdot487f_{53}+45\cdot5878f_{54}+34\cdot6633f_{57}\\ &-179\cdot7086f_{60}+42\cdot4238f_{61}-44\cdot9105f_{62}+42\cdot4238f_{64}+687\cdot689f_{68}\end{aligned}$$

§ 5. (H) Triangulation south of the side Ceder Berg—Heerenlogement's Berg.

Logarithmic values of the factors f_1, f_2......

f_1 = −9·91973	f_{15} = +0·63399	f_{29} = +9·73324	f_{42} = +0·48046	f_{56} = −8·65860
f_2 = +9·73787	f_{16} = +0·34098	f_{30} = +0·44371	f_{43} = −0·48244	f_{57} = +9·01991
f_3 = −8·55543	f_{17} = +0·14173	f_{31} = −0·84156	f_{44} = −1·12461	f_{58} = +8·70141
f_4 = +9·19335	f_{18} = −0·58308	f_{32} = +0·79432	f_{45} = +0·70377	f_{59} = +9·05961
f_5 = +0·11034	f_{19} = +0·28088	f_{33} = −0·95223	f_{47} = −1·29596	f_{60} = −9·43077
f_6 = −8·68068	f_{20} = −1·11516	f_{34} = −0·90025	f_{48} = +0·25766	f_{61} = −9·28526
f_7 = −8·52901	f_{21} = −0·68797	f_{35} = +0·23345	f_{49} = −0·69224	f_{62} = −0·06224
f_8 = −9·55029	f_{22} = −0·38805	f_{36} = −0·46948	f_{50} = −0·84230	f_{63} = +9·50777
f_9 = +0·75540	f_{23} = +9·96247	f_{37} = +0·45471	f_{51} = −9·36458	f_{64} = +9·10193
f_{10} = +0·69891	f_{24} = +8·99238	f_{38} = −9·95431	f_{52} = −8·82221	f_{65} = −9·22879
f_{11} = −0·64617	f_{25} = −0·38589	f_{39} = −0·56894	f_{53} = +8·85937	f_{66} = −8·06324
f_{12} = −0·38389	f_{26} = −0·24527	f_{40} = −0·56165	f_{54} = −7·60160	f_{67} = −9·59077
f_{13} = +0·88983	f_{27} = −9·63679	f_{41} = +0·26098	f_{55} = −8·32853	f_{68} = −9·31187
f_{14} = +0·60339	f_{28} = −0·15540			

Resulting values of the corrections x_1, x_2......

x_1 = −″·1303	x_{20} = +″·2191	x_{39} = −″·0503	x_{58} = +″·3627	x_{116} = −″·7723	x_{135} = −1″·2731
x_2 = +·0515	x_{21} = −·5225	x_{40} = −·0403	x_{59} = +·9783	x_{117} = −·1628	x_{136} = −1·0451
x_3 = −·2078	x_{22} = −·2405	x_{41} = +·0939	x_{60} = −·8405	x_{118} = −·9980	x_{137} = +·0615
x_4 = +·0459	x_{23} = +·1758	x_{42} = −·6680	x_{61} = +·1949	x_{119} = +·1549	x_{138} = +·8369
x_5 = +·0858	x_{24} = −·3767	x_{43} = −·0071	x_{62} = +·2812	x_{120} = +2·2145	x_{139} = −·7814
x_6 = −·0128	x_{25} = +·7188	x_{44} = −·1861	x_{63} = −1·5688	x_{121} = −2·0581	x_{140} = +·2463
x_7 = +·2930	x_{26} = −·2746	x_{45} = +·5886	x_{64} = +·0991	x_{122} = −1·8141	x_{141} = −·5284
x_8 = −·3414	x_{27} = +·3736	x_{46} = +·6827	x_{65} = −·7950	x_{123} = +·5677	x_{142} = +·0878
x_9 = −·6474	x_{28} = +·0408	x_{47} = +1·4759	x_{66} = −·0778	x_{124} = −·1165	x_{143} = −1·3784
x_{10} = +·3178	x_{29} = −·1632	x_{48} = −1·3271	x_{69} = +·8640	x_{125} = −·3621	x_{144} = −·3684
x_{11} = +·1370	x_{30} = +·1380	x_{49} = +·3020	x_{107} = −·1036	x_{126} = −·2874	x_{145} = −·5019
x_{12} = −·7326	x_{31} = −·8973	x_{50} = −·5197	x_{108} = +·0263	x_{127} = −·7070	x_{146} = −·2963
x_{13} = +·3303	x_{32} = −·7307	x_{51} = −1·3728	x_{109} = −·1528	x_{128} = −·2016	x_{147} = −·4690
x_{14} = −·3587	x_{33} = +·2162	x_{52} = −·6818	x_{110} = +·0853	x_{129} = −·1102	x_{148} = −·1252
x_{15} = −·0446	x_{34} = +1·1629	x_{53} = +·8714	x_{111} = +2·8325	x_{130} = −·4756	x_{149} = −·3310
x_{16} = −·7079	x_{35} = −·0390	x_{54} = +1·2461	x_{112} = +·9376	x_{131} = +·5404	x_{150} = +·7885
x_{17} = −·5328	x_{36} = +1·0344	x_{55} = −·4028	x_{113} = −1·8390	x_{132} = +·0373	x_{151} = −1·7254
x_{18} = +·7880	x_{37} = −·5791	x_{56} = +1·0611	x_{114} = +·0564	x_{133} = −·9790	x_{152} = +·0350
x_{19} = +·1254	x_{38} = +·5377	x_{57} = −·7225	x_{115} = −·6305	x_{134} = +·2819	

5. (A) Triangulation north of the side Heerenlogement's Berg—Bokkeveld's Berg.

Formation of the Equations of Condition.

Nos. of the Equations.	STATION POINTS.	ANGLES.	EQUATIONS OF CONDITION.
		° ′ ″	
1	Louis Fontein......... Heerenlogement's Berg. Bokkeveld's Berg.....	$53 \cdot 59 \cdot 39 \cdot 22 + x_{76}$ $49 \cdot 50 \cdot 58 \cdot 75 + x_{68}$ $76 \cdot\ 9 \cdot 45 \cdot 54 + x_{70}$	$0 = 0'' \cdot 909 + x_{68} + x_{70} + x_{76}$
	Sum.......... $180° + \varepsilon$.	180· 0·23·51 180· 0·22·601	
2	Kamies-Sector Berg... Louis Fontein......... Bokkeveld's Berg.....	$52 \cdot 13 \cdot 51 \cdot 45 + x_{92}$ $87.43 \cdot\ 1 \cdot 61 + x_{77}$ $40 \cdot\ 3 \cdot 24 \cdot 30 + x_{72}$	$0 = -0'' \cdot 533 + x_{72} + x_{77} + x_{92}$
	Sum.......... $180° + \varepsilon$.	180· 0·17·36 180· 0·17·893	
3	Eland's Hoogte....... Heerenlogement's Berg. Bokkeveld's Berg.....	$77 \cdot\ 2 \cdot 14 \cdot 75 + x_{74}$ $37 \cdot 51 \cdot 30 \cdot 32 + x_{67}$ $65 \cdot\ 6 \cdot 28 \cdot 41 + x_{71}$	$0 = -0'' \cdot 592 + x_{67} + x_{71} + x_{74}$
	Sum.......... $180° + \varepsilon$.	180· 0·13·48 180· 0·14·072	
4	Kamies-Sector Berg... Eland's Hoogte....... Bokkeveld's Berg.....	$31 \cdot 31 \cdot 46 \cdot 71 + x_{91}$ $97 \cdot 21\ 48 \cdot 60 + x_{75}$ $51 \cdot\ 6 \cdot 41 \cdot 43 + x_{70} - x_{71} + x_{72}$	$0 = 2 \cdot'' 319 + x_{70} - x_{71} + x_{72} + x_{75} + x_{91}$
	Sum.......... $180° + \varepsilon$.	180· 0·16·74 180· 0 14·421	
5	Keibiskow............ Bokkeveld's Berg..... Kamies-Sector Berg...	$66 \cdot 39\ 15 \cdot 48 + x_{80}$ $89 \cdot 48 \cdot 56 \cdot 78 + x_{73}$ $23 \cdot 32 \cdot\ 1 \cdot 73 + x_{95}$	$0 = 1 \cdot'' 294 + x_{73} + x_{80} + x_{95}$
	Sum.......... $180° + \varepsilon$.	180· 0·13·99 180· 0·15·284	
6	Boschluis............ Keibiskow............ Kamies-Sector Berg...	$84 \cdot\ 0 \cdot 12 \cdot 94 + x_{106}$ $45 \cdot 12 \cdot 26 \cdot 71 + x_{81}$ $50 \cdot 47 \cdot 43 \cdot 66 + x_{93}$	$0 = 0 \cdot'' 255 + x_{81} + x_{93} + x_{106}$
	Sum.......... $180° + \varepsilon$.	180· 0·23·31 180· 0·23·055	
7	Koe Berg............ Kamies-Sector Berg... Boschluis............	$84 \cdot 57 \cdot 46 \cdot 23 + x_{100}$ $38 \cdot 21 \cdot 35 \cdot 41 + x_{94}$ $56 \cdot 40 \cdot 51 \cdot 29 + x_{105}$	$0 = 1 \cdot'' 877 + x_{94} + x_{100} + x_{105}$
	Sum.......... $180° + \varepsilon$.	180· 0·12·93 180· 0·11·053	

§ 5. (A) Triangulation north of the side Heeren-logement's Berg—Bok-keveld's Berg.

Formation of the Equations of Condition.

Nos. of the Equations.	STATION POINTS.	ANGLES.	EQUATIONS OF CONDITION.
		° ′ ″	
8	Roode Wal........... Louis Fontein......... Kamies-Sector Berg... Sum.......... $180°+\varepsilon$.	$64 \cdot 7 \cdot 56 \cdot 08+x_{82}$ $54 \cdot 59 \cdot 16 \cdot 63+x_{79}$ $60 \cdot 52 \cdot 57 \cdot 40+x_{96}$ $180 \cdot 0 \cdot 10 \cdot 11$ $180 \cdot 0 \cdot 11 \cdot 593$	$0=-1'' \cdot 483+x_{79}+x_{82}+x_{96}$
9	Vogel Klip........... Roode Wal........... Kamies-Sector Berg... Sum.......... $180°+\varepsilon$.	$46 \cdot 23 \cdot 9 \cdot 82+x_{88}$ $47 \cdot 41 \cdot 21 \cdot 25+x_{84}$ $85 \cdot 55 \cdot 40 \cdot 74+x_{97}$ $180 \cdot 0 \cdot 11 \cdot 81$ $180 \cdot 0 \cdot 12 \cdot 307$	$0=-0'' \cdot 497+x_{84}+x_{88}+x_{97}$
10	Ezel's Kop........... Roode Wal........... Louis Fontein......... Sum.......... $180°+\varepsilon$.	$64 \cdot 20 \cdot 17 \cdot 25+x_{85}$ $65 \cdot 9 \cdot 49 \cdot 28+x_{82}+x_{84}-x_{83}$ $50 \cdot 30 \cdot 1 \cdot 76+x_{78}$ $180 \cdot 0 \cdot 8 \cdot 29$ $180 \cdot 0 \cdot 10 \cdot 677$	$0=-2 \cdot'' 387+x_{78}+x_{82}-x_{83}+x_{84}+x_{85}$
11	Vogel Klip........... Roode Wal........... Ezel's Kop........... Sum.......... $180°+\varepsilon$.	$41 \cdot 29 \cdot 7 \cdot 83+x_{87}$ $46 \cdot 39 \cdot 28 \cdot 05+x_{83}$ $91 \cdot 51 \cdot 34 \cdot 35+x_{86}$ $180 \cdot 0 \cdot 10 \cdot 23$ $180 \cdot 0 \cdot 11 \cdot 052$	$0=-0'' \cdot 822+x_{83}+x_{86}+x_{87}$
12	Koe Berg........... Vogel Klip........... Kamies-Sector Berg... Sum.......... $180°+\varepsilon$.	$60 \cdot 26 \cdot 55 \cdot 56+x_{101}$ $71 \cdot 17 \cdot 6 \cdot 15+x_{89}$ $48 \cdot 16 \cdot 9 \cdot 61+x_{99}$ $180 \cdot 0 \cdot 11 \cdot 32$ $180 \cdot 0 \cdot 10 \cdot 240$	$0=1 \cdot'' 080+x_{89}+x_{99}+x_{101}$
13	North-Sector Station... Vogel Klip........... Kamies-Sector Berg... Sum.......... $180°+\varepsilon$.	$56 \cdot 16 \cdot 53 \cdot 40+x_{103}$ $70 \cdot 14 \cdot 25 \cdot 00+x_{90}$ $53 \cdot 28 \cdot 54 \cdot 50+x_{98}$ $180 \cdot 0 \cdot 12 \cdot 90$ $180 \cdot 0 \cdot 11 \cdot 460$	$0=1 \cdot'' 440+x_{90}+x_{98}+x_{103}$
14	Koe Berg........... Vogel Klip........... North-Sector Station... Sum.......... $180°+\varepsilon$.	$170 \cdot 45 \cdot 5 \cdot 17+x_{102}$ $1 \cdot 2 \cdot 41 \cdot 15+x_{89}-x_{90}$ $8 \cdot 12 \cdot 18 \cdot 58+x_{104}$ $180 \cdot 0 \cdot 4 \cdot 90$ $180 \cdot 0 \cdot 0 \cdot 190$	$0=4 \cdot'' 710+x_{89}-x_{90}+x_{102}+x_{104}$

§ 5.
(B)
Triangulation north of the side Heerenlogement's Berg—Bokkeveld's Berg.

Formation of the Equations of Condition.

KAMIES-SECTOR BERG STATION.

At this Station a circumference is formed as follows :—

Bokkeveld's Berg	and Louis Fontein....	$52^\circ\ 13'\ 51''\cdot45+x_{92}$	51.85 T
Louis Fontein....	and Roode Wal......	$60\cdot52\cdot57\cdot40+x_{96}$	57,67 B
Roode Wal......	and Vogel Klip......	$85\cdot55\cdot40\cdot74+x_{97}$	40.91 B
Vogel Klip......	and Koe Berg.......	$48\cdot16\cdot\ 9\cdot61+x_{99}$	11.61 B
Koe Berg.......	and Boschluis.......	$38\cdot21\cdot35\cdot41+x_{94}$	37,52 B
Boschluis.......	and Keibiskow......	$50\cdot47\cdot43\cdot66+x_{93}$	44.30 B
Keibiskow......	and Bokkeveld's Berg	$23\cdot32\cdot\ 1\cdot73+x_{95}$	1.98 T
	Sum..	$360\cdot00\cdot00\cdot00$	

Hence : (15) $0=x_{92}+x_{93}+x_{94}+x_{95}+x_{96}+x_{97}+x_{99}$

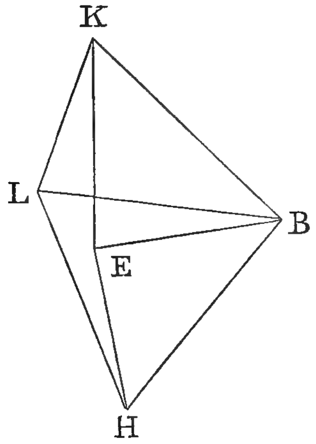
(C)

In the figure KLBHE we have :

$$\frac{BK}{BL}\times\frac{BL}{BH}\times\frac{BH}{BE}\times\frac{BE}{BK}=1$$

Therefore :

$$\frac{\text{Sin. BLK. Sin. BHL. Sin. BEH. Sin. BKE.}}{\text{Sin. BKL. Sin. BLH. Sin. BHE. Sin. BEK.}}=1$$



K ...Kamies-Sector Bg.
B...Bokkeveld's Berg.
H...Heerenlogement'sB.
L...Louis Fontein.
E...Eland's Hoogte.

CALCULATION.

	ANGLES.	$\frac{1}{3}\varepsilon$.	ANGLES $-\frac{1}{3}\varepsilon$.	LOG. SINES.	CO-EFFICIENTS OF THE CORRECTIONS.
BLK	$87^\circ\ 43'\ 1''\cdot61$	$5''\cdot964$	$87^\circ\ 42'\ 55''\cdot646$	$9\cdot9996546\cdot5$	$0\cdot840\ x_{77}$
BHL	$49\cdot50\cdot58\cdot75$	$7\cdot534$	$49\cdot50\cdot51\cdot216$	$9\cdot8832817\cdot8$	$17\cdot763\ x_{68}$
BEH	$77\cdot\ 2\cdot14\cdot75$	$4\cdot691$	$77\cdot\ 2\cdot10\cdot059$	$9\cdot9887870\cdot3$	$4\cdot847\ x_{74}$
BKE	$31\cdot31\cdot46\cdot71$	$4\cdot809$	$31\cdot31\cdot41\cdot901$	$9\cdot7184349\cdot9$	$34\cdot321\ x_{91}$
			Sum..	$9\cdot5901584\cdot5$	

§ 5. (C) Triangulation north of the side Heeren-logement's Berg—Bok-keveld's Berg.

Formation of the Equations of Condition.

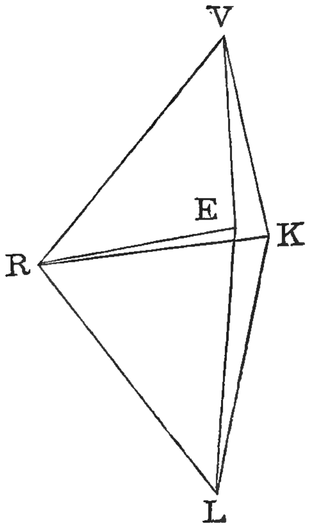
CALCULATION—*continued.*

	ANGLES.	$\frac{1}{3}\varepsilon$.	ANGLES—$\frac{1}{3}\varepsilon$.	LOG. SINES.	CO-EFFICIENTS OF THE CORRECTIONS.
BKL	52° 13′ 51″·45	5″·964	52° 13′ 45″·486	9·8978844·9	16·315 x_{92}
BLH	53·59·39·22	7·534	53·59·31·686	9·9079143·5	15·302 x_{76}
BHE	37·51·30·32	4·691	37·51·25·629	9·7879522·0	27·090 x_{67}
BEK	97·21·48·60	4·809	97·21·43·791	9·9964048·9	− 2·720 x_{75}
			Sum..	9·5901559·3	

$$(16):0=25\cdot2-27\cdot090x_{67}+17\cdot763x_{68}+4\cdot847x_{74}+2\cdot720x_{75}-15\cdot302x_{76}+0\cdot840x_{77}+34\cdot321x_{91}-16\cdot315x_{92}$$

In the figure VKRLE we have:

$$\frac{RK}{RV}\times\frac{RV}{RE}\times\frac{RE}{RL}\times\frac{RL}{RK}=1$$



V...Vogel Klip.
K...Kamies-Sector Berg.
L...Louis Fontein.
E...Ezel's Kop.
R...Roode Wal.

Therefore:

$$\frac{\text{Sin. RVK}\quad\text{Sin. REV.}\quad\text{Sin. RLE.}\quad\text{Sin. RKL.}}{\text{Sin. RKV.}\quad\text{Sin. RVE.}\quad\text{Sin. REL.}\quad\text{Sin. RLK.}}=1$$

CALCULATION.

	ANGLES.	$\frac{1}{3}\varepsilon$.	ANGLES—$\frac{1}{3}\varepsilon$.	LOG. SINES.	CO-EFFICIENTS OF THE CORRECTIONS.
RVK	46° 23′ 9″·82	4″·102	46° 23′ 5″·718	9·8597327·4	20·061 x_{88}
REV	91·51·34·35	3·684	91·51·30·666	9·9997715·5	− 0·683 x_{86}
RLE	50·30· 1·76	3·559	50·29·58·201	9·8874029·5	17·357 x_{78}
RKL	60·52·57·40	3·864	60·52·53·536	9·9413203·3	11·728 x_{96}
			Sum..	9·6882275·7	

§ 5. (C) Triangulation north of the side Heerenlogement's Berg—Bokkeveld's Berg.

Formation of the Equations of Condition.

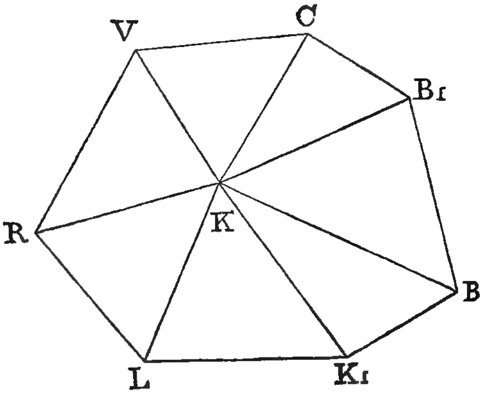
CALCULATION—*continued.*

	ANGLES.	$\frac{1}{3}\,\varepsilon$.	ANGLES—$\frac{1}{3}\varepsilon$.	LOG. SINES.	CO-EFFICIENTS OF THE CORRECTIONS.
RKV	85° 55′ 40″·74	4″·102	85° 55′ 36″·638	9 9989017·0	1·499 x_{97}
RVE	41·29· 7·83	3·684	41·29· 4·146	9·8211316·5	23·812 x_{87}
REL	64·20·17·25	3·559	64·20·13·691	9·9548973·0	10·117 x_{85}
RLK	54·59·16·63	3·864	54·59·12·766	9·9132948·3	14·751 x_{79}
			Sum..	9·6882254·8	

(17): $0=20\cdot9+17\cdot357_{78}-14\cdot751x_{79}-10\cdot117x_{85}-0\cdot683x_{86}-23\cdot812x_{87}+20\cdot061x_{88}+11\cdot728x_{96}-1\cdot499x_{97}$

In the Polygon VCB_IBK_ILR we have:

$$\frac{KL}{KR}\times\frac{KR}{KV}\times\frac{KV}{KC}\times\frac{KC}{KB_I}\times\frac{KB_I}{KB}\times\frac{KB}{KK_I}\times\frac{KK_I}{KL}=1$$



V...Vogel Klip.
C...Koe Berg.
B_I....Boschluis.
B...Bokkeveld's Berg.
K_I...Klip Rug.
L...Louis Fontein.
R...Roode Wal.
K...Kamies-Sector Berg.

$$\frac{\text{Sin. }KRL.\ \text{Sin. }KVR.\ \text{Sin. }KCV.\ \text{Sin. }KB_IC.\ \text{Sin. }KBB_I.\ \text{Sin. }KK_IB.\ \text{Sin. }KLK_I.}{\text{Sin. }KLR.\ \text{Sin. }KRV.\ \text{Sin. }KVC.\ \text{Sin. }KCB_I.\ \text{Sin. }KB_IB.\ \text{Sin. }KBK_I.\ \text{Sin. }KK_IL}=1$$

CALCULATION.

	ANGLES.	$\frac{1}{3}\,\varepsilon$.	ANGLES—$\frac{1}{3}\varepsilon$.	LOG. SINES.	CO-EFFICIENTS OF THE CORRECTIONS.
KRL	64° 7′ 56″·08	3″·864	64° 7′ 52″·216	9 9541437·2	10·210 x_{82}
KVR	46·23· 9·82	4·102	46·23· 5·718	9·8597327·4	20·061 x_{88}
KCV	60·26·55·56	3·413	60·26·52·147	9·9394727·8	11·938 x_{101}
KB_IC	56·40·51·29	3·684	56·40·47·606	9·9220060·4	13·841 x_{105}
KBB_I	45·12·26·71	7·685	45·12·19·025	9 8510354·5	20·905 x_{t1}
KK_IB	89·48·56·78	5·095	89·48·51·685	9·9999977·0	0·068 x_{73}
KLK_I	87·43· 1·61	5·964	87·42·55·646	9·9996546·5	0·840 x_{77}
			Sum..	9·5260430·8	

§ 5. (C) Triangulation north of the side Heerenlogement's Berg—Bokkeveld's Berg.

Formation of the Equations of Condition.

CALCULATION—*continued.*

	ANGLES.	$\frac{1}{3}$ ε.	ANGLES—$\frac{1}{3}$ε.	LOG. SINES.	CO-EFFICIENTS OF THE CORRECTIONS.
KLR	54° 59′ 16″·63	3″·864	54° 59′ 12″·766	9·9132948·3	14·751 x_{79}
KRV	47·41·21·25	4·102	47·41·17·148	9·8689330·8	19·167 x_{84}
KVC	71·17· 6·15	3·413	71·17· 2·737	9·9764055·9	7·133 x_{89}
KCB_I	84·57·46·23	3·684	84·57·42·546	9·9983188·1	1·856 x_{100}
KB_IB	84· 0·12·94	7·685	84· 0· 5·255	9·9976155·5	2·212 x_{106}
KBK_I	66·39·15·48	5·095	66·39·10·385	9·9628998·5	9·088 x_{80}
KK_IL	40· 3·24·30	5·964	40· 3·18·336	9·8085646·7	25·044 x_{72}
			Sum..	9·5260323·8	

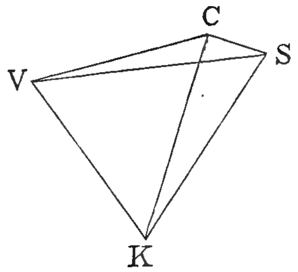
(18): $0=107\cdot0-25\cdot044x_{72}+0\cdot068x_{73}+0\cdot840x_{77}-14\cdot751x_{79}-9\cdot088x_{80}+20\cdot905x_{81}+10\cdot210x_{82}$
$-19\cdot167x_{84}+22\cdot061x_{88}-7\cdot133x_{89}-1\cdot856x_{100}+11\cdot938x_{101}+13\cdot841x_{105}-2\cdot212x_{106}$

In the quadrilateral CSKV we have:

$$\frac{VS}{VC}\times\frac{VC}{VK}\times\frac{VK}{VS}=1$$

Therefore:

$$\frac{\text{Sin. VCS. Sin. VKC. Sin. VSK.}}{\text{Sin. VSC. Sin. VCK. Sin. VKS.}}=1$$



C...Koe Berg.
S....North-end Sector Station.
K...Kamies-Sector Berg.
V...Vogel Klip.

CALCULATION.

	ANGLES.	$\frac{1}{3}$ ε.	ANGLES—$\frac{1}{3}$ε.	LOG. SINES.	CO-EFFICIENTS OF THE CORRECTIONS.
VCS	170° 45′ 5″·17	0″·063	170° 45′ 5″·107	9·2060648·2	−129·340 x_{102}
VKC	48·16· 9·61	3·413	48·16· 6·197	9·8728965·7	18·780 x_{99}
VSK	56·16·53·40	3·820	56·16·49·580	9·9200004·1	14·053 x_{103}
			Sum..	8·9989618·0	

§ 5. (C) Triangulation north of the side Heeren-logement's Berg—Bok-keveld's Berg.

Formation of the Equations of Condition.

CALCULATION—*continued.*

	ANGLES.	$\frac{1}{3}\,\varepsilon$.	ANGLES—$\frac{1}{3}\varepsilon$.	LOG. SINES.	CO-EFFICIENTS OF THE CORRECTIONS.
VSC	$8°\ 12'\ 18''\cdot58$	$0''\cdot063$	$8°\ 12'\ 18''\cdot517$	9·1544781·5	$146\cdot023\ x_{104}$
VCK	$60\cdot26\cdot55\cdot56$	$3\cdot413$	$60\cdot26\cdot52\cdot147$	9·9394727·8	$11\cdot938\ x_{101}$
VKS	$53\cdot28\cdot54\cdot50$	$3\cdot820$	$53\cdot28\cdot50\cdot680$	9·9050706·6	$15\cdot591\ x_{98}$
			Sum..	8·9990215·9	

$$(19):\ 597\cdot9+15\cdot591x_{98}-18\cdot780x_{99}+11\cdot938x_{101}+129\cdot340x_{102}-14\cdot053x_{103}+146\cdot023x_{104}$$

Abstract of Equations of Condition.

(D)

$$(1)\quad 0 = 0''\cdot909+x_{68}+x_{70}+x_{76}$$
$$(2)\quad 0 = -0\cdot533+x_{72}+x_{77}+x_{92}$$
$$(3)\quad 0 = -0\cdot592+x_{67}+x_{71}+x_{74}$$
$$(4)\quad 0 = 2\cdot319+x_{70}-x_{71}+x_{72}+x_{75}+x_{91}$$
$$(5)\quad 0 = -1\cdot294+x_{73}+x_{80}+x_{95}$$
$$(6)\quad 0 = 0\cdot255+x_{81}+x_{93}+x_{106}$$
$$(7)\quad 0 = 1\cdot877+x_{94}+x_{100}+x_{105}$$
$$(8)\quad 0 = -1\cdot483+x_{79}+x_{82}+x_{96}$$
$$(9)\quad 0 = -0\cdot497+x_{84}+x_{88}+x_{97}$$
$$(10)\quad 0 = -2\cdot387+x_{78}+x_{82}-x_{83}+x_{84}+x_{85}$$
$$(11)\quad 0 = -0\cdot822+x_{83}+x_{86}+x_{87}$$
$$(12)\quad 0 = 1\cdot080+x_{89}+x_{99}+x_{101}$$
$$(13)\quad 0 = 1\cdot440+x_{90}+x_{98}+x_{103}$$
$$(14)\quad 0 = 4\cdot710+x_{89}-x_{90}+x_{102}+x_{104}$$
$$(15)\quad 0 = 0\cdot000+x_{92}+x_{93}+x_{94}+x_{95}+x_{96}+x_{97}+x_{99}$$
$$(16)\quad 0 = 25\cdot2-27\cdot090x_{67}+17\cdot763x_{68}+4\cdot847x_{74}+2\cdot720x_{75}-15\cdot302x_{76}+0\cdot840x_{77}+34\cdot321x_{91} -16\cdot315x_{92}$$
$$(17)\quad 0 = 20\cdot9+17\cdot357x_{78}-14\cdot751x_{79}-10\cdot117x_{85}-0\cdot683x_{86}-23\cdot812x_{87}+20\cdot061x_{88} +11\cdot728x_{96}-1\cdot499x_{97}$$
$$(18)\quad 0 = 107\cdot0-25\cdot044x_{72}+0\cdot068x_{73}+0\cdot840x_{77}-14\cdot751x_{79}-9\cdot088x_{80}+20\cdot905x_{81}+10\cdot210x_{82} -19\cdot167x_{84}+20\cdot061x_{88}-7\cdot133x_{89}-1\cdot856x_{100}+11\cdot938x_{101}+13\cdot841x_{105} -2\cdot212x_{106}$$
$$(19)\quad 0 = 597\cdot9+15\cdot591x_{98}-18\cdot780x_{99}+11\cdot938x_{101}+129\cdot340x_{102}-14\cdot053x_{103}+146\cdot023x_{104}$$

§ 5.
(E)
Triangulation north of the side Heerenlogement's Berg—Bokkeveld's Berg

The Corrections x_1, x_2......(multiplied by the weights) in terms of the factors f_1, f_2......

$5\cdot0x_{67} = f_3-27\cdot090f_{16}$
$7\cdot1x_{68} = f_1+17\cdot763f_{16}$
$10\cdot0x_{70} = f_1+f_4$
$10\cdot0x_{71} = f_3-f_4$
$10\cdot7x_{72} = f_2+f_4-25\cdot044f_{18}$
$13\cdot4x_{73} = f_5+\cdot0680f_{18}$
$9\cdot3x_{74} = f_3+4\cdot847f_{16}$
$9\cdot0x_{75} = f_4+2\cdot720f_{16}$
$12\cdot0x_{76} = f_1-15\cdot302f_{16}$
$12\cdot0x_{77} = f_2+\cdot840f_{16}+\cdot840f_{18}$
$7\cdot2x_{78} = f_{10}+17\cdot357f_{17}$
$14\cdot2x_{79} = f_8-14\cdot751f_{17}-14\cdot751f_{18}$
$8\cdot2x_{80} = f_5-9\cdot088f_{18}$
$6\cdot2x_{81} = f_6+20\cdot905f_{18}$
$9\cdot6x_{82} = f_8+f_{10}+10\cdot210f_{18}$
$8\cdot4x_{83} = -f_{10}+f_{11}$
$12\cdot0x_{84} = f_9+f_{10}-19\cdot167f_{18}$
$3\cdot34x_{85} = f_{10}-10\cdot117f_{17}$
$2\cdot68x_{86} = f_{11}-\cdot683f_{17}$
$2\cdot2x_{87} = f_{11}-23\cdot812f_{17}$
$4\cdot8x_{88} = f_9+20\cdot061f_{17}+20\cdot061f_{18}$
$7\cdot7x_{89} = f_{12}+f_{14}-7\cdot133f_{18}$
$9\cdot1x_{90} = f_{13}-f_{14}$
$11\cdot0x_{91} = f_4+34\cdot321f_{16}$
$8\cdot0x_{92} = f_2+f_{15}-16\cdot315f_{16}$
$4\cdot93x_{93} = f_6+f_{15}$
$1\cdot54x_{94} = f_7+f_{15}$
$13\cdot2x_{95} = f_5+f_{15}$
$12\cdot0x_{96} = f_8+f_{15}+11\cdot728f_{17}$
$18\cdot9x_{97} = f_9+f_{15}-1\cdot499f_{17}$
$10\cdot24x_{98} = f_{13}+15\cdot591f_{19}$
$1\cdot62x_{99} = f_{12}+f_{15}-18\cdot780f_{19}$
$5\cdot09x_{100} = f_7-1\cdot856f_{18}$
$11\cdot56x_{101} = f_{12}+11\cdot938f_{18}+11\cdot938f_{19}$
$2\cdot64x_{102} = f_{14}+129\cdot34f_{19}$
$59\cdot5x_{103} = f_{13}-14\cdot053f_{19}$
$10\cdot92x_{104} = f_{14}+146\cdot023f_{19}$
$4\cdot0x_{105} = f_7+13\cdot841f_{18}$
$5\cdot94x_{106} = f_6-2\cdot212f_{18}$

§ 5. (F) Triangulation north of the side Heeren-logement's Berg—Bok-keveld's Berg.

The Corrections x_1, x_2......in terms of the factors f_1, f_2......

$x_{67} = \cdot 2000 f_3 - 5\cdot 4180 f_{16}$

$x_{68} = \cdot 1408 f_1 + 2\cdot 5018 f_{16}$

$x_{70} = \cdot 1000 f_1 + \cdot 1000 f_4$

$x_{71} = \cdot 1000 f_3 - \cdot 1000 f_4$

$x_{72} = \cdot 0935 f_2 + \cdot 0935 f_4 - 2\cdot 3406 f_{18}$

$x_{73} = \cdot 0746 f_5 + \cdot 0051 f_{18}$

$x_{74} = \cdot 1075 f_3 + \cdot 5212 f_{16}$

$x_{75} = \cdot 1111 f_4 + \cdot 3022 f_{16}$

$x_{76} = \cdot 0833 f_1 - 1\cdot 2752 f_{16}$

$x_{77} = \cdot 0833 f_2 + \cdot 0700 f_{16} + \cdot 0700 f_{18}$

$x_{78} = \cdot 1389 f_{10} + 2\cdot 4107 f_{17}$

$x_{79} = \cdot 0704 f_8 - 1\cdot 0388 f_{17} - 1\cdot 0388 f_{18}$

$x_{80} = \cdot 1220 f_5 - 1\cdot 1084 f_{18}$

$x_{81} = \cdot 1613 f_6 + 3\cdot 3718 f_{18}$

$x_{82} = \cdot 1042 f_8 + \cdot 1042 f_{10} + 1\cdot 0635 f_{18}$

$x_{83} = -\cdot 1190 f_{10} + \cdot 1190 f_{11}$

$x_{84} = \cdot 0833 f_9 + \cdot 0833 f_{10} - 1\cdot 5973 f_{18}$

$x_{85} = \cdot 2994 f_{10} - 3\cdot 0289 f_{17}$

$x_{86} = \cdot 3731 f_{11} - \cdot 2549 f_{17}$

$x_{87} = \cdot 4545 f_{11} - 10\cdot 8236 f_{17}$

$x_{88} = \cdot 2083 f_9 + 4\cdot 1795 f_{17} + 4\cdot 1795 f_{18}$

$x_{89} = \cdot 1299 f_{12} + \cdot 1299 f_{14} - \cdot 9264 f_{18}$

$x_{90} = \cdot 1099 f_{13} - \cdot 1099 f_{14}$

$x_{91} = \cdot 0909 f_4 + 3\cdot 1201 f_{16}$

$x_{92} = \cdot 1250 f_2 + \cdot 1250 f_{15} - 2\cdot 0394 f_{16}$

$x_{93} = \cdot 2028 f_6 + \cdot 2028 f_{15}$

$x_{94} = \cdot 6494 f_7 + \cdot 6494 f_{15}$

$x_{95} = \cdot 0758 f_5 + \cdot 0758 f_{15}$

$x_{96} = \cdot 0833 f_8 + \cdot 0833 f_{15} + \cdot 9773 f_{17}$

$x_{97} = \cdot 0529 f_9 + \cdot 0529 f_{15} - \cdot 0793 f_{17}$

$x_{98} = \cdot 0977 f_{13} + 1\cdot 5226 f_{19}$

$x_{99} = \cdot 6173 f_{12} + \cdot 6173 f_{15} - 11\cdot 5930 f_{19}$

$x_{100} = \cdot 1965 f_7 - \cdot 3647 f_{18}$

$x_{101} = \cdot 0865 f_{12} + 1\cdot 0327 f_{18} + 1\cdot 0327 f_{19}$

$x_{102} = \cdot 3788 f_{14} + 48\cdot 9924 f_{19}$

$x_{103} = \cdot 0168 f_{13} - \cdot 2362 f_{19}$

$x_{104} = \cdot 0916 f_{14} + 13\cdot 3720 f_{19}$

$x_{105} = \cdot 2500 f_7 + 3\cdot 4603 f_{18}$

$x_{106} = \cdot 1684 f_6 - \cdot 3725 f_{18}$

§ 5. (G) Triangulation north of the side Heeren-logement's Berg—Bok-keveld's Berg.

Final Equations for determining the values of the factors f_1, f_2.

No. of Equation.	0 =	f_1	f_2	f_3	f_4	f_5	f_6	f_7	f_8	f_9	f_{10}	f_{11}	f_{12}	f_{13}	f_{14}	f_{15}	f_{16}	f_{17}	f_{18}	f_{19}
	"																			
1	+ ·909	+ ·3241	. .	. .	+ ·1000	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	+ 1·2266	. .	. .	. .
2	− 533	. .	+ ·3018	. .	+ ·0935	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	+ ·1250	− 1·9694	. .	− 2·2706	. .
3	− ·592	. .	. .	+ ·4075	− ·1000	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	− 4·8968	. .	. .	. .
4	+2·319	+ ·1000	+ ·0935	− ·1000	+ ·4955	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	+ 3·4223	. .	− 2·3406	. .
5	−1·294	. .	. .	. .	. .	+ ·2724	. .	. .	. .	. .	. .	. .	. .	. .	. .	+ ·0758	. .	. .	− 1·1033	. .
6	+0·255	. .	. .	. .	. .	. .	+ ·5325	. .	. .	. .	. .	. .	. .	. .	. .	+ ·2028	. .	. .	+ 2·9993	. .
7	+1·877	. .	. .	. .	. .	. .	. .	+1·0959	. .	. .	. .	. .	. .	. .	. .	+ ·6494	. .	. .	+ 3·0956	. .
8	−1·483	. .	. .	. .	. .	. .	. .	. .	+·2579	. .	+·1042	. .	. .	. .	. .	+ ·0833	. .	− ·0615	+ ·0247	. .
9	− ·497	. .	. .	. .	. .	. .	. .	. .	. .	+ ·3445	+·0833	. .	. .	. .	. .	+ ·0529	. .	+ 4·1002	+ 2·5822	. .
10	−2·387	. .	. .	. .	. .	. .	. .	. .	+·1042	+ ·0833	+·7448	− ·1190	. .	. .	. .	. .	. .	− ·6182	− ·5338	. .
11	− ·822	. .	. .	. .	. .	. .	. .	. .	. .	. .	−·1190	+ ·9466	. .	. .	. .	. .	. .	− 11·0785	. .	. .
12	+1·080	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	+ ·8337	. .	+ ·1299	+ ·6173	. .	. .	+ ·1063	− 10·5603
13	+1·440	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	+ ·2244	− ·1099	. .	. .	. .	. .	+ 1·2864
14	+4·710	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	+ ·1299	− ·1099	+ ·7102	. .	. .	. .	− ·9264	+ 62·3644
15	0·000	. .	+ ·1250	. .	. .	+ ·0758	+ ·2028	+ .6494	+·0833	+ ·0529	. .	. .	+ ·6173	. .	. .	+ 1·8065	− 2·0394	+ ·8980	. .	− 11·5930
16	25·2	+1·2266	−1·9694	−4·8968	+3·4223	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	− 2·0394	+354·4902	. .	+ ·0588	. .
17	20·9	. .	. .	. .	. .	. .	. .	. .	−·0615	+4·1002	−·6183	−11·0785	. .	. .	. .	+ ·8980	. .	+441·1401	+ 99·1657	. .
18	107·0	. .	−2·2706	. .	−2·3406	−1·1033	+2·9993	+3·0956	+·0247	+2·5822	−·5338	. .	+ ·1063	. .	− ·9264	. .	+ ·0588	+ 99·1657	+348·2092	+ 12·3284
19	597·9	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	−10·5603	+1·2864	+62·3644	−11·5930	. .	. .	+ 12·3284	+8545·723

§ 5.
(H)
Triangulation north of the side Heerenlogement's Berg—Bokkeveld's Berg.

Logarithmic values of the factors f_1, f_2......

$f_1 = -9\cdot83415$	$f_{11} = +0\cdot29597$
$f_2 = +0\cdot07799$	$f_{12} = +9\cdot98163$
$f_3 = -9\cdot49998$	$f_{13} = -1\cdot01692$
$f_4 = -0\cdot83042$	$f_{14} = -0\cdot91518$
$f_5 = +0\cdot53446$	$f_{15} = -0\cdot14139$
$f_6 = +0\cdot38554$	$f_{16} = -7\ 95484$
$f_7 = +9\cdot48006$	$f_{17} = +8\cdot85597$
$f_8 = +0\cdot73175$	$f_{18} = -9\cdot62610$
$f_9 = +0\cdot53825$	$f_{19} = -7\cdot92630$
$f_{10} = +0\cdot32969$	

Resulting values of the corrections x_1, x_2......

"	"
$x_{67} = -\ \cdot0147$	$x_{88} = -\ \cdot7476$
$x_{68} = -\ \cdot1187$	$x_{89} = -\ \cdot5523$
$x_{70} = -\ \cdot7450$	$x_{90} = -\ \cdot2386$
$x_{71} = +\ \cdot6451$	$x_{91} = -\ \cdot6432$
$x_{72} = +\ \cdot4687$	$x_{92} = -\ \cdot0051$
$x_{73} = +\ \cdot2532$	$x_{93} = +\ \cdot2119$
$x_{74} = -\ \cdot0387$	$x_{94} = -\ \cdot7032$
$x_{75} = -\ \cdot7545$	$x_{95} = +\ \cdot1546$
$x_{76} = -\ \cdot0453$	$x_{96} = +\ \cdot4039$
$x_{77} = +\ \cdot0695$	$x_{97} = +\ \cdot1038$
$x_{78} = +\ \cdot4698$	$x_{98} = -1\cdot0287$
$x_{79} = +\ \cdot7442$	$x_{99} = -\ \cdot1653$
$x_{80} = +\ \cdot8863$	$x_{100} = +\ \cdot2136$
$x_{81} = -1\cdot0336$	$x_{101} = -\ \cdot3624$
$x_{82} = +\ \cdot3349$	$x_{102} = -3\cdot5298$
$x_{83} = -\ \cdot0190$	$x_{103} = -\ \cdot1727$
$x_{84} = +1\cdot1410$	$x_{104} = -\ \cdot8664$
$x_{85} = +\ \cdot4222$	$x_{105} = -1\cdot3874$
$x_{86} = +\ \cdot7193$	$x_{106} = +\ \cdot5666$
$x_{87} = +\ \cdot1217$	

SECTION VI.

CALCULATION

OF THE

PRINCIPAL TRIANGLES.

NOTE.—The triangles 1 to 24 and 42 to 64 inclusive, are comprised in the *first* system of equations for the investigation of the corrections of the angles, and the triangles 27 to 41 inclusive, are employed in the *second* system.

The numerical values of the two series of corrections will be found at pages 521 and 532.

The corrections to the angles of the triangles 25 and 26 (which could not be included in the investigation), have been obtained by dividing the error of each triangle into parts proportional to the reciprocals of the weights of the angles.

§ 6.

NAMES OF STATIONS.	Nos. of the Angles.	ANGLES.	Corrections to the Angles.	Cor-rections $-\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	REFERENCES.
△ 1.—Measured Base = 42819·065 Feet...Log. 4·6316371.								
Kapoc Berg..................	20	33° 37′ 47″·12	+″·219	+ ″·039	47″·159	9·7433719		
East End of Base..........	3	44·53·24·99	—·208	— ·388	24·602	9·8486509	4·7369161	
West End of Base.........	1	101·28·48·55	—·130	— ·311	48·239	9·9912234	4·8794886	
Sum...............		180· 0· 0·66	—·119	— ·660	0·000		Feet.	
180+ε.		180· 0· 0·541					54565·24	
Error.......... ...		+0·119					75768·48	
△ 2.—East End of Base to Kapoc Berg = 75768·48 Feet...Log. 4·8794886. (From △ 1.)								
Riebeek's Kasteel..........	27	33·50·58·30	+·374	— ·270	58·030	9·7458651		
East End of Base..........	5	93·29·48·40	+·086	— ·558	47·842	9·9991907	5·1328142	See △ 7.
Kapoc Berg..................	9	52·39·15·42	—·648	—1·292	14·128	9·9003594	5·0339829	See △ 6.
Sum...............		180· 0· 2·12	—·188	—2·120	0·000		Feet.	
180+ε.		180· 0· 1·932					135773·25	
Error.............		+0·188					108139·13	
△ 3.—Measured Base = 42819·065 Feet...Log. 4·6316371.								
K. F. Contre Berg	24	39·29·18·20	—·377	— ·574	17·626	9·8034023		
East End of Base..........	6	62·58·29·91	—·013	— ·210	29·700	9·9497840	4·7780188	
West End of Base.........	2	77·32·12·82	+·052	— ·146	12·674	9·9896433	4·8178781	
Sum...............		180· 0· 0 930	—·338	— ·930	0·000		Feet.	
180+ε.		180· 0· 0·592					59981·71	
Error.............		+0·338					65747·33	
△ 4.—East End of Base to K. F. Contre Berg = 65747·33 Feet...Log. 4·8178781. (From △ 3.)								
Drie Fontein................	26	50·41·39·63	—·275	— ·634	38·996	9·8886151		
East End of Base..	4	63· 7·21·43	+·046	— ·313	21·117	9·9503528	4·8796158	
K. F. Contre Berg.........	23	66·11· 0·07	+·176	— ·183	59·887	9·9613461	4·8906091	
Sum..............		180· 0· 1·130	—·053	—1·130	0·000		Feet.	
180+ε.		180· 0· 1·077					75790·68	
Error.............		+0·053					77733·66	
△ 5.—East End of Base to Drie Fontein = 77733·66 Feet...Log. 4·8906091. (From △ 4.)								
Zwart Berg..................	35	44·40·29·04	—·039	— ·546	28·494	9·8470043		
East End of Base..........	7	86·35·55·16	+·293	— ·215	54·945	9·9992343	5·0428391	
Drie Fontein................	25	48·43·36·35	+·719	+ ·211	36·561	9·8759712	4·9195760	
Sum...............		180· 0· 0·550	+·973	—0·550	0·000		Feet.	
180+ε.		180· 0· 1·523					110366·97	
Error..............		—0·973					83095·21	

§ 6.

NAMES OF STATIONS.	Nos. of the Angles.	ANGLES.	Corrections to the Angles.	Corrections $-\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	REFERENCES.
△ 6.—East End of Base to Zwart Berg = 83095·21 Feet...Log. 4·9195760. (From △ 5.)								
Riebeek's Kasteel..........	29	43° 2′ 26″·42	− ″·163	− ″·844	25″·576	9·8341118		
Zwart Berg..................	38	62·38·59·93	+ ·538	− ·143	59·787	9·9485187	5·0339829	See △ 2.
East End of Base..........	8	74·18·35·66	− ·342	−1·023	34·637	9·9835078	5·0689720	
Sum...............		180· 0· 2·010	+ ·033	−2·010	0·000		Feet.	
180+ε.		180· 0· 2·043					108139·13	
Error.............		− ·033					117211·97	
△ 7.—Zwart Berg to Riebeek's Kasteel = 117211·97 Feet...Log. 5·0689720. (From △ 6.)								
Kapoc Berg..................	22	46·16·30·70	− ·240	−1·460	29·240	9·8589359		
Zwart Berg..................	37	56·50· 8·85	− ·579	−1·799	7·051	9·9227781	5·1328142	See △ 2.
Riebeek's Kasteel..........	27+29	76·53·24·72	+ ·210	−1·011	23·709	9·9885305	5·1985666	
Sum...............		180· 0· 4·270	− ·609	−4·270	0·000		Feet.	
180+ε.		180· 0· 3·661					135773·25	
Error.............		+0·609					157967·09	
△ 8.—Zwart Berg to Kapoc Berg = 157967·09 Feet...Log. 5·1985666. (From △ 7.)								
Piket Berg..................	49−43	26·57·50·70	+ ·309	− ·993	49·707	9·6565079		
Zwart Berg..................	34+36	129·57· 9·77	+2·197	+ ·895	10 665	9·8845529	5·4266116	See △ 9.
Kapoc Berg..................	13−22	23· 4·60·36	+ ·571	− ·732	59·628	9·5933613	5·1354200	
Sum...............		180· 0· 0·830	+3·077	− ·830	0·000		Feet.	
180+ε.		180· 0· 3·907					267061·72	
Error.............		−3·077					136590·35	
△ 9.—Kapoc Berg to Riebeek's Kasteel = 135773·25 Feet...Log. 5·1328142. (From △'s 2 & 7.)								
Piket Berg..................	48	30· 5·58·55	−1·327	−3·998	54·552	9·7002604		
Kapoc Berg..................	13	69·21·31·06	+ ·330	−2·341	28·719	9·9711836	5·4037374	
Riebeek's Kasteel.	28	80·32·39·36	+ ·041	−2·631	36·729	9·9940578	5·4266116	See △ 8.
Sum...............		180· 0· 8·970	− ·956	−8·970	0·000		Feet.	
180+ε.		180· 0· 8·014					253359·59	
Error.............		+0 956					267061·72	
△ 10.—Zwart Berg to Kapoc Berg = 157967·09 Feet...Log. 5·1985666. (From △ 7.)								
Patrys Berg................	41	41· 0·47·77	+ ·094	−2·454	45·316	9·8170527		
Zwart Berg..................	34	78·49· 2·39	+1·163	−1·385	1·005	9·9916746	5·3731885	See △ 12.
Kapoc Berg	11	60·10·16·09	+ ·137	−2·411	13·679	9·9382741	5·3197880	See △ 11.
Sum...............		180· 0· 6·250	+1·394	−6·250	0·000		Feet.	
180+ε.		180· 0· 7·644					236150·33	
Error.......... ...		−1·394					208827·64	

§ 6.

NAMES OF STATIONS.	Nos. of the Angles.	ANGLES.	Corrections to the Angles.	Corrections $-\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	REFERENCES.
△ 11.—Zwart Berg to Piket Berg = 136590·35 Feet...Log. 5·1354200. (From △ 8.)								
Patrys Berg..............	40	40° 49′ 18″·04	− ″·040	−1″·789	16″·251	9·8153787		
Piket Berg..............	49	88· 2·38·53	+ ·302	−1·447	37·083	9·9997468	5·3197881	See △ 10.
Zwart Berg..............	36	51· 8· 7·38	+1·034	−0·714	6·666	9·8913303	5·2113716	See △ 12.
Sum..............		180· 0· 3·950	+1·296	−3·950	0·000		Feet.	
180+ε.		180· 0· 5·246					208827·69	
Error..............		−1·296					162694·01	
△ 12.—Kapoc Berg to Piket Berg = 267061·72 Feet...Log. 5·4266116. (From △'s 8 & 9.)								
Patrys Berg..............	40+41	81·50· 5·81	+ ·054	−2·940	2·870	9·9955743		
Kapoc Berg..............	11−13+22	37· 5·15·73	− ·434	−3·428	12·302	9·7803342	5·2113715	See △ 11.
Piket Berg..............	43	61· 4·47·83	− ·007	−3·002	44·828	9·9421511	5·3731884	See △ 10.
Sum..............		180· 0· 9·370	− ·387	−9·370	0·000		Feet.	
180+ε.		180· 0· 8·983					162693·97	
Error..............		+0·387					236150·27	
△ 13.—Piket Berg to Patrys Berg = 162694·01 Feet...Log. 5·2113716. (From △ 11.)								
Eland's Berg..............	57	51·13·56·10	− ·723	−2·596	53·504	9·8919179		
Piket Berg..............	44	83·57·35·08	− ·186	−2·060	33·020	9·9975817	5·3170354	
Patrys Berg..............	39	44·48·35·40	− ·050	−1·924	33·476	9·8480347	5·1674884	
Sum..............		180· 0· 6·580	− ·959	−6·580	0·000		Feet.	
180+ε.		180· 0· 5·621					207508·28	
Error..............		+0·959					147057·91	
△ 14.—Eland's Berg to Piket Berg = 147057·91 Feet...Log. 5·1674884. (From △ 13.)								
Lambert's Hoek..............	59	59·53·53·79	+ ·978	− ·464	53·326	9·9370840		
Eland's Berg..............	54+56−55	67·45·33·23	+2·710	+1·268	34·498	9·9664252	5·1968296	
Piket Berg..............	45	52·20·33·03	+ ·589	− ·854	32·176	9·8985467	5·1289511	
Sum..............		180· 0· 0·050	+4·277	− ·050	0·000		Feet.	
180+ε.		180· 0· 4·327					157336·56	
Error..............		−4·277					134570·87	
△ 15.—Eland's Berg to Lambert's Hoek Berg = 134570·87 Feet...Log. 5·1289511. (From △ 14.)								
Heerenlogement's Berg..	69	55·31·38·25	+ ·864	− ·484	37·766	9·9161352		
Eland's Berg..............	55	58·41·16·52	− ·403	−1·751	14·769	9·9316332	5·1444491	See △ 17.
Lambert's Hoek..............	58	65·47· 8·45	+ ·363	− ·985	7·465	9·9600023	5·1728182	See △ 16.
Sum..............		180· 0· 3·220	+ ·824	−3·220	0·000		Feet.	
180+ε.		180· 0· 4·044					139459·81	
Error..............		−0·824					148873·77	

§ 6.

NAMES OF STATIONS.	Nos. of the Angles.	ANGLES.	Corrections to the Angles.	Corrections $-\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	REFERENCES.

△ 16.—Eland's Berg to Piket Berg = 147057·91 Feet...Log. 5·1674884. (From △ 13.)

Heerenlogement's Berg..	64−66	26°35′57″·19	+″·177	−1″·209	55″·981	9·6510275		
Eland's Berg...............	54+56	126·26 49·75	+2·307	+ ·920	50·670	9·9054734	5·4219343	See △ 17.
Piket Berg.................	47	26·57·13·26	+1·476	+ ·089	13·349	9·6563574	5·1728183	See △ 15.
Sum..............		180· 0· 0·200	+3·960	− ·200	0·000		Feet.	
$180+\varepsilon$.		180· 0· 4·160					264200·91	
Error..............		−3·960					148873·80	

△ 17.—Piket Berg to Lambert's Hoek Berg = 157336·56 Feet...Log. 5·1968296. (From △ 14.)

Heerenlogement's Berg..	66+69−64	28·55·41·06	+ ·687	− ·716	40·344	9·6845835		
Piket Berg..................	45−47	25·23·19·77	− ·888	−2·291	17·479	9·6322030	5·1444491	See △ 15.
Lambert's Hoek...........	58+59	125·41· 2·24	+1·341	− ·063	2·177	9·9096881	5·4219342	See △ 16.
Sum..............		180· 0· 3·070	+1·140	−3·070	0·000		Feet.	
$180+\varepsilon$.		180· 0· 4·210					139459·81	
Error..............		−1·140					264200·85	

△ 18.—Eland's Berg to Piket Berg = 147057·91 Feet...Log. 5·1674884. (From △ 13.)

Ceder Berg..................	61	35·18·16·07	+ ·195	−2·398	13·672	9·7618615		
Piket Berg..................	46+47	81·58·17·84	+2·159	−0·434	17·406	9·9957223	5·4013492	See △ 20.
Eland's Berg...............	54	62·43·30·27	+1·246	−1·348	28·922	9·9488113	5·3544382	See △ 19.
Sum..............		180· 0· 4·180	+3·600	−4·180	0·000		Feet.	
$180+\varepsilon$.		180· 0· 7·780					251970·23	
Error..............		−3·600					226171·67	

△ 19.—Piket Berg to Heerenlogement's Berg = 264200·85 Feet...Log. 5·4219342· (From △ 17.)

Ceder Berg..................	62	70·57·46·03	+ ·281	− 3·574	42·456	9·9755702		
Piket Berg..................	46	55· 1· 4·58	+ ·683	− 3·172	1·408	9·9134550	5·3598190	See △'s 20, 24.
Heerenlogement's Berg..	66	54· 1·20·07	− ·078	− 3·934	16·136	9·9080741	5·3544381	See △ 18.
Sum..............		180· 0·10·680	+ ·886	−10·680	0·000		Feet.	
$180+\varepsilon$.		180· 0·11·566					228991·32	
Error..............		−0·886					226171·61	

△ 20.—Eland's Berg to Heerenlogement's Berg = 148873·80 Feet...Log. 5·1728183. (From △ 16.)

Ceder Berg..................	62−61	35·39·29·96	+ ·086	− 2·562	27·398	9·7656240		
Eland's Berg..............	56	63·43·19·48	+1·061	− 1·588	17·892	9·9526247	5·3598190	See △'s 19, 24.
Heerenlogement's Berg...	64	80·37·17·26	+ ·099	− 2·550	14·710	9·9941548	5·4013491	See △ 18.
Sum..............		180· 0· 6·700	+1·246	− 6·700	0·000		Feet.	
$180+\varepsilon$.		180· 0· 7·946					228991·32	
Error..............		−1·246					251970·17	

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NAMES OF STATIONS.	Nos. of the Angles.	ANGLES.	Corrections to the Angles.	Corrections $-\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	REFERENCES.
△ 21.—Kapoc Berg to Patrys Berg = 236150·27 Feet...Log. 5·3731884. (From △ 12.)								
		° ′ ″	″	″	″			
Kapitein's Kloof...........	50	62·23·20·32	— ·520	— 3·573	16·747	9·9474859		
Patrys Berg	42	78·40·51·71	— ·668	- 3·721	47·989	9·9914681	5·4171706	
Kapoc Berg..................	12	38·55·59·05	— ·732	— 3·786	55·264	9·7982347	5·2239372	
Sum...............		180· 0·11·080	—1·920	—11·080	0·000		Feet.	
180+ε.		180· 0· 9·160					261318·80	
Error.............		+1·920					167470·08	
△ 22.—Kapoc Berg to Kapitein's Kloof = 261318·80 Feet...Log. 5·4171706. (From △ 21.)								
Winter Berg	142	65·19·23·84	+ ·088	— 4·054	19·786	9·9584061		
Kapitein's Kloof...........	53	62·40·54·74	+ ·871	— 3·271	51·469	9·9486402	5·4074047	
Kapoc Berg..................	10	51·59·52·57	+ ·318	— 3·825	48·745	9·8965136	5·3552781	
Sum..............		180· 0.11·150	+1·277	—11·150	0·000		Feet.	
180+ε.		180· 0·12·427					255508·12	
Error..............		—1·277					226609·48	
△ 23.—Winter Berg to Kapitein's Kloof = 226609·48 Feet...Log. 5·3552781. (From △ 22.)								
Ceder Berg..................	63	53· 2·11·23	—1·569	— 5·422	5·808	9·9025481		
Kapitein's Kloof...........	51	74·43· 2·58	—1·373	— 5·226	57·354	9·9843611	5·4370911	
Winter Berg	143	52·14·62·07	—1·378	— 5·232	56·838	9·8980008	5·3507308	
Sum...............		180· 0·15·880	—4·320	—15·880	0·000		Feet.	
180+ε.		180· 0 11·560					273584·28	
Error..............		+4·320					224249·12	
△ 24.—Kapitein's Kloof to Ceder Berg = 224249·12 Feet...Log. 5·3507308. (From △ 23.)								
Heerenlogement's Berg...	65	52·26· 6·12	— ·795	— 4·672	1·448	9·8990808		
Kapitein's Kloof...........	52	54· 2·22·86	— ·682	— 4·560	18·300	9·9081690	5·3598190	See △'s 19, 20.
Ceder Berg..................	60	73·31·44·97	— ·840	— 4·718	40·252	9·9817994	5·4334494	
Sum...............		180· 0·13·950	—2·317	—13·950	0·000		Feet.	
180+ε.		180· 0·11·633					228991·32	
Error..............		+2·317					271299·75	
△ 25.—Heerenlogement's Berg to Ceder Berg = 228991·32 Feet...Log. 5·3598190. (From △ 19.)								
Klip Rug......................	$\frac{1}{w}$=·100	49·16·13·36	+ ·272	— 4·227	9·133	9·8795452		
Heerenlogement's Berg...	·143	64· 0·30·63	+ ·389	— 4·111	26·519	9·9536874	5·4339612	
Ceder Berg..................	·157	66·43·28·42	+ ·428	— 4·072	24·348	9·9631302	5·4434040	
Sum...............		180· 0·12·410	+1·089	—12·410	0·000		Feet.	
180+ε.		180· 0·13·499					271619·69	
Error..............		—1·089					277590 13	

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NAMES OF STATIONS.	Nos. of the Angles.	ANGLES.	Corrections to the Angles.	Corrections $-\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	REFERENCES.
△ 26.—Heerenlogement's Berg to Klip Rug = 277590·13 Feet...Log. 5·4434040. (From △ 25.)								
Bokkeveld's Berg	$\frac{1}{w}$=·100	° ′ ″ 57·53·47·19	″ + ·243	″ − 4·474	″ 42·716	9·9279231		
Heerenlogement's Berg..	·143	41·56·14·81	+ ·347	− 4·371	10·439	9·8249735	5·3404544	
Klip Rug.....................	·100	80·10·11·32	+ ·243	− 4·475	6·845	9·9935748	5·5090557	
Sum...............		180· 0·13·320	+0·833	−13·320	0·000		Feet.	
180+ε.		180· 0·14·153					219005·20	
Error..............		−0·833					322890·82	
△ 27.—Heerenlogement's B. to Bokkeveld's B. = 322890·82 Feet...Log. 5·5090557. (From △ 26.)								
Louis Fontein...............	76	53·59·39·22	− ·045	− 7·578	31·642	9·9079143		
Heerenlogement's Berg..	68	49·50·58·75	− ·119	− 7·653	51·097	9·8832816	5·4844230	
Bokkeveld's Berg..........	70	76· 9·45·54	− ·745	− 8·279	37·261	9·9872053	5·5883467	
Sum...............		180· 0·23·510	−0·909	−23·510	0·000		Feet.	
180+ε.		180· 0·22·601					305086·50	
Error..............		+0·909					387566·90	
△ 28.—Louis Fontein to Bokkeveld's Berg = 305086·50 Feet...Log. 5·4844230. (From △ 27.)								
Kamies-Sector Berg......	92	52·13·51·45	− ·005	− 5·969	45·481	9·8978845		
Louis Fontein...............	77	87·42·61·61	+ ·069	− 5·895	55·715	9·9996547	5·5861932	See △ 30.
Bokkeveld's Berg..........	72	40· 3·24·30	+ ·469	− 5·496	18·804	9·8085659	5·3951044	
Sum...............		180· 0·17·360	+ ·533	−17·360	0·000		Feet.	
180+ε.		180· 0·17·893					385649·91	
Error..............		−0·533					248373·03	
△ 29.—Heerenlogement's B. to Bokkeveld's B. = 322890·82 Feet...Log. 5·5090557. (From △ 26.)								
Eland's Hoogte.............	74	77· 2·14·75	− ·039	− 4·729	10·021	9·9887870		
Heerenlogement's Berg..	67	37·51·30·32	− ·014	− 4·705	25·615	9·7879522	5·3082209	
Bokkeveld's Berg..........	71	65· 6·28·41	+ ·645	− 4·046	24·364	9·9576522	5·4779209	
Sum...............		180· 0·13·480	+ ·592	−13·480	0·000		Feet.	
180+ε.		180· 0·14·072					203339·11	
Error		−0·592					300552·88	
△ 30.—Eland's Hoogte to Bokkeveld's Berg = 203339·11 Feet...Log. 5·3082209. (From △ 29.)								
Kamies-Sector Berg......	91	31·31·46·71	− ·643	− 5·450	41·260	9·7184328		
Eland's Hoogte.............	75	97·21·48·60	− ·755	− 5·562	43·038	9·9964051	5·5861932	See △ 28.
Bokkeveld's Berg..........	70−71+72	51· 6·41·43	− ·921	− 5·728	35·702	9·8911760	5·4809641	
Sum...............		180· 0·16·740	−2·319	−16·740	0·000		Feet.	
180+ε.		180· 0·14·421					385649·91	
Error..............		+2·319					302666·32	

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NAMES OF STATIONS.	Nos. of the Angles.	ANGLES.	Corrections to the Angles.	Corrections −⅓ ε.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	REFERENCES.
△ 31.—Bokkeveld's Berg to Kamies-Sector B. = 385649·91 Feet...Log. 5·5861932. (From △ 28.)								
Keibiskow	80	66°·39′·15″·48	+ ″·886	− ″4·208	11″·272	9·9629006		
Bokkeveld's Berg	73	89·48·56·78	+ ·253	− 4·842	51·938	9·9999977	5·6232903	
Kamies-Sector Berg	95	23·31·61·73	+ ·155	− 4·940	56·790	9·6012648	5·2245574	
Sum		180· 0·13·990	+1·294	−13·990	0·000		Feet.	
180+ε.		180· 0·15·284					420039·71	
Error		−1·294					167709·38	
65688 Toises **△ 32.—Kamies-Sector Berg to Keibiskow = 420039·71 Feet...Log. 5·6232903. (From △ 31.)** 0. 805810								
Boschluis	106	84· 0·12·94	+ ·567	− 7·118	5·822	9·9976157		
Keibiskow	81	45·12·26·71	−1·034	− 8·719	17·991	9·8510333	5·4767079	
Kamies-Sector Berg	93	50·47·43·66	+ ·212	− 7·473	36·187	9·8892297	5·5149043	
Sum		180· 0·23·310	− ·255	−23·310	0·000		Feet.	
180+ε.		180· 0·23·055					299714·62	
Error		+0·255					327268·57	
△ 33.—Kamies-Sector Berg to Boschluis = 299714·62 Feet...Log. 5·4767079. (From △ 32.)								
Koe Berg	100	84·57·46·23	+ ·213	− 3·472	42·758	9·9983189		
Kamies-Sector Berg	94	38·21·35·41	− ·703	− 4·387	31·023	9·7927989	5·2711879	
Boschluis	105	56·40·51·29	−1·387	− 5·071	46·219	9·9220041	5·4003931	See △'s 38, 41.
Sum		180· 0·12·930	−1·877	−12·930	0·000		Feet.	
180+ε.		180· 0·11·053					186718·75	
Error		+1·877					251416·13	
△ 34.—Louis Fontein to Kamies-Sector Berg = 248373·03 Feet...Log. 5·3951044. (From △ 28.)								
Roode Wal	82	64· 7·56·08	+ ·335	− 3·529	52·551	9·9541441		
Louis Fontein	79	54·59·16·63	+ ·744	− 3·120	13·510	9·9132960	5·3542563	
Kamies-Sector Berg	96	60·52·57·40	+ ·404	− 3·461	53·939	9·9413208	5·3822811	
Sum		180· 0·10·110	+1·483	−10·110	0·000		Feet.	
180+ε.		180· 0·11·593					226076·98	
Error		−1·483					241146·56	
△ 35.—Kamies-Sector Berg to Roode Wal = 226076·98 Feet...Log. 5·3542563. (From △ 34.)								
Vogel Klip	88	46·23· 9·82	− ·748	− 4·850	4·970	9·8597312		
Roode Wal	84	47·41 21·25	+1·141	− 2·961	18·289	9·8689352	5·3634603	
Kamies-Sector Berg	97	85·55·40·74	+ ·104	− 3·999	36·741	9·9989017	5·4934268	See △ 37.
Sum		180· 0·11·810	+ ·497	−11·810	0·000		Feet.	
180+ε.		180· 0·12·307					230919·36	
Error		−0·497					311477·57	

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NAMES OF STATIONS.	Nos. of the Angles.	ANGLES.	Corrections to the Angles.	Corrections $-\frac{1}{3}\epsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	REFERENCES.

△ 36.—Louis Fontein to Roode Wal = 241146·56 Feet...Log. 5·3822811. (From △ 34.)

Ezel's Kop..................	85	64° 20′ 17″·25	+ ″·422	− 3″·137	14″·113	9·9548977		
Roode Wal..................	82−83+84	65· 9·49·28	+1·495	− 2·064	47·216	9·9578501	5·3852335	
Louis Fontein..............	78	50·29·61·76	+ ·470	− 3·089	58·671	9·8874037	5·3147871	
Sum..............		180· 0· 8·290	+2·387	− 8·290	0·000		Feet.	
180+ε.		180· 0·10·677					242791·51	
Error..............		−2·387					206436·78	

△ 37.—Roode Wal to Ezel's Kop = 206436·78 Feet...Log. 5·3147871. (From △ 36.)

Vogel Klip..................	87	41·29· 7·83	+ ·122	− 3·562	4·268	9·8211319		
Roode Wal..................	83	46·39·28·05	− ·019	− 3·703	24·347	9·8616867	5·3553419	
Ezel's Kop..................	88	91·51·34·35	+ ·719	− 2·965	31·385	9·9997715	5·4934267	See △ 35.
Sum..............		180· 0·10·230	+ ·822	−10·230	0·000		Feet.	
180+ε.		180· 0·11·052					226642·77	
Error..............		−0·822					311477·50	

△ 38.—Kamies-Sector Berg to Vogel Klip = 230919·36 Feet...Log. 5·3634603. (From △ 35.)

Koe Berg....................	101	60·26·55·56	− ·363	− 3·776	51·784	9·9394723		
Vogel Klip..................	89	71·17· 6·15	− ·552	− 3·965	2·185	9·9764051	5·4003931	See △'s 33, 41.
Kamies-Sector Berg......	99	48·16· 9·61	− ·165	− 3·579	6·031	9·8728963	5·2968843	See △ 40.
Sum..............		180· 0·11·320	−1·080	−11·320	0·000		Feet.	
180+ε.		180· 0·10·240					251416·13	
Error..............		+1·080					198099·91	

△ 39.—Kamies-Sector Berg to Vogel Klip = 230919·36 Feet...Log. 5·3634603. (From △ 35.)

North-Sector Station.....	103	56·16·53·40	− ·173	− 3·993	49·407	9·9200002		
Vogel Klip..................	90	70·14·25·00	− ·238	− 4·058	20·942	9·9736414	5·4171015	
Kamies-Sector Berg......	98	53·28·54·50	−1·029	− 4·849	49·651	9·9050691	5·3485292	
Sum..............		180· 0·12·900	−1·440	−12·900	0·000		Feet.	
180+ε.		180· 0·11·460					261277·19	
Error..............		+1·440					223115·23	

△ 40.—Vogel Klip to North-end Sector Station = 223115·23 Feet...Log. 5·3485292. (From △ 39.)

Koe Berg....................	102	170·45· 5·17	−3·530	− 3·593	1·577	9·2061105		
Vogel Klip..................	89−90	1· 2·41·15	− ·314	− 0·377	40·773	8·2608279	4·4032466	See △ 41.
North-end Sector Station	104	8·12·18·58	− ·866	− 0·930	17·650	9·1544655	5·2968842	See △ 38.
Sum..............		180· 0· 4·900	−4·710	− 4·900	0·000		Feet.	
180+ε.		180· 0· 0·190					25307·35	
Error..............		+4·710					198099·86	

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NAMES OF STATIONS.	Nos. of the Angles.	ANGLES.	Corrections to the Angles.	Corrections $-\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	REFERENCES.
△ 41.—Kamies-Sector B. to North-end Sect. St. = 261277·19 Feet...Log. 5·4171015. (From △ 39.)								
Koe Berg....................	102—101	110° 18′ 9″·61	—3″·168	— 3″·638	5″·972	9·9721467		
Kamies-Sector Berg......	98—99	5·12·44·89	— ·863	— 1·333	43·557	8·9582909	4·4032457	See △ 40.
North-Sector Station.....	103+104	64·29·11·98	—1·039	— 1·509	10·471	9·9554385	5·4003933	See △'s 33, 38.
Sum...............		180· 0· 6·480	—5·070	— 6·480	0·000		Feet.	
180+ε.		180· 0· 1·410					25307·29	
Error..............		+5·070					251416·24	
△ 42.—Kapoc Berg to Riebeek's Kasteel = 135773·25 Feet...Log. 5·1328142. (From △ 2.)								
Rogge Bay..................	107	33·33·35·14	— ·104	— 2·042	33·098	9·7425666		
Kapoc Berg..................	17	98·13·19·23	— ·533	— 2·471	16·759	9·9955137	5·3857613	
Riebeek's Kasteel..........	32	48·13·12·81	— ·730	— 2·667	10·143	9·8725657	5·2628133	
Sum...............		180· 0. 7·180	—1·367	— 7·180	0·000		Feet.	
180+ε.		180· 0· 5·813					243086·76	
Error..............		+1·367					183152·70	
△ 43.—Rogge Bay to Riebeek's Kasteel = 243086·76 Feet...Log. 5·3857613. (From △ 42.)								
Simon's Berg...............	123	91·23·47·49	+ ·568	— 1·639	45·851	9·9998711		
Rogge Bay..................	108	50·58·58·02	+ ·026	— 2·181	55·839	9·8903931	5·2762833	See△'s 44,48,51.
Riebeek's Kasteel..........	33—32	37·37·19·57	+ ·947	— 1·260	18·310	9·7856472	5·1715374	See △ 45.
Sum...............		180· 0· 5·080	+1·541	— 5·080	0·000		Feet.	
180+ε.		180· 0· 6·621					188922·35	
Error..............		—1·541					148435·38	
△ 44.—Kapoc Berg to Riebeek's Kasteel = 135773·25 Feet...Log. 5·1328142. (From △ 2.)								
Simon's Berg...............	120	37· 5·45·63	+2·215	+ ·201	45·831	9·7804276		
Kapoc Berg..................	14	57· 3·45·96	— ·359	— 2·373	43·587	9·9238968	5·2762834	See△'s 43,48,51.
Riebeek's Kasteel.	33	85·50·32·38	+ ·216	— 1·798	30·582	9·9988553	5·3512419	See△'s 45,47.50.
Sum...............		180· 0· 3·970	+2·072	— 3·970	0·000		Feet.	
180+ε.		180· 0· 6·042					188922·39	
Error..............		—2·072					224513·21	
△ 45.—Rogge Bay to Kapoc Berg = 183152·70 Feet...Log. 5·2628133. (From △ 42.)								
Simon's Berg...............	123—120	54·18· 1·86	—1·647	— 3·777	58·083	9·9095978		
Kapoc Berg..................	17—14	41· 9·33·27	— ·174	— 2·305	30·965	9·8183220	5·1715375	See △ 43.
Rogge Bay..................	107+108	84·32·33·16	— ·077	— 2·208	30·952	9·9980265	5·3512420	See△'s 44,47,50.
Sum...............		180· 0· 8·290	—1·898	— 8·290	0·000		Feet.	
180+ε.		180· 0· 6·392					148435·41	
Error..............		+1·898					224513·26	

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NAMES OF STATIONS.	Nos. of the Angles.	ANGLES.	Corrections to the Angles.	Corrections $-\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	REFERENCES.

Δ 46.—Kapoc Berg to Riebeek's Kasteel = 135773·25 Feet...Log. 5·1328142. (From Δ 2.)

NAMES OF STATIONS.	Nos. of the Angles.	ANGLES.	Corrections to the Angles.	Corrections $-\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	REFERENCES.
Royal Observatory.........	110	34°30′ 6″·59	+ ″·085	− 1″·935	4″·655	9·7531423		
Kapoc Berg..................	16	93·20·23·15	− ·708	− 2·728	20·422	9·9992621	5·3789340	
Riebeek's Kasteel..........	31	52· 9·37·84	− ·897	− 2·917	34·923	9·8974752	5·2771471	
Sum...............		180· 0· 7·580	−1·520	− 7·580	0·000		Feet.	
180+ε.		180· 0· 6·060					239295·22	
Error..............		+1·520					189298·47	

Δ 47.—Royal Observatory to Kapoc Berg = 189298·47 Feet...Log. 5·2771471. (From Δ 46.)

NAMES OF STATIONS.	Nos. of the Angles.	ANGLES.	Corrections to the Angles.	Corrections $-\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	REFERENCES.
Simon's Berg...............	122	57·17·63·07	−1·814	− 3·793	59·277	9·9250587		
Royal Observatory........	111	86·25·25·01	+2·832	+ 0·852	25·862	9·9991535	5·3512419	See Δ's 44,45,50.
Kapoc Berg..................	16−14	36·16·37·19	− ·349	− 2·329	34·861	9·7720872	5·1241756	See Δ 48.
Sum...............		180· 0· 5·270	+0·669	− 5·270	0·000		Feet.	
180+ε.		180· 0· 5·939					224513·21	
Error..............		−0·669					133099·24	

Δ 48.—Royal Observatory to Riebeek's Kasteel = 239295·22 Feet...Log. 5·3789340. (From Δ 46.)

NAMES OF STATIONS.	Nos. of the Angles.	ANGLES.	Corrections to the Angles.	Corrections $-\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	REFERENCES.
Simon's Berg...............	120+122	94·23·48·70	+ ·400	− 1·573	47·127	9·9987202		
Royal Observatory........	111−110	51·55·18·42	+2·747	+ 0·773	19·193	9·8960695	5·2762833	See Δ's 43,44,51.
Riebeek's Kasteel..........	33−31	33·40·54·54	+1·114	− 0·860	53·680	9·7439618	5·1241756	See Δ 47.
Sum...............		180· 0· 1·660	+4·261	− 1·660	0·000		Feet.	
180+ε.		180· 0· 5·921					188922·35	
Error..............		−4·261					133099·24	

Δ 49.—Kapoc Berg to Riebeek's Kasteel = 135773·25 Feet...Log. 5·1328142. (From Δ 2.)

NAMES OF STATIONS.	Nos. of the Angles.	ANGLES.	Corrections to the Angles.	Corrections $-\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	REFERENCES.
King's Battery..............	126	32·58·17·12	− ·287	− 2·352	14·768	9·7357674		
Kapoc Berg..................	15	95·53·41·99	− ·045	− 2·110	39·880	9·9976977	5·3947445	
Riebeek's Kasteel...	30	51· 8· 7·28	+ ·138	− 1·928	5·352	9·8913281	5·2883749	
Sum...............		180· 0· 6·390	− ·194	− 6·390	0·000		Feet.	
180+ε.		180· 0· 6·196					248167·26	
Error..............		+0·194					194256·21	

Δ 50.—King's Battery to Kapoc Berg = 194256·21 Feet...Log. 5·2883749. (From Δ 49.)

NAMES OF STATIONS.	Nos. of the Angles.	ANGLES.	Corrections to the Angles.	Corrections $-\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	REFERENCES.
Simon's Berg...............	121	58·59·62·68	−2·058	− 4·211	58·469	9·9330637		
King's Battery.............	127	82·10·10·20	−0·707	− 2·860	7·340	9·9959306	5·3512418	See Δ's 44,45,47.
Kapoc Berg..................	15−14	38·49·56·03	+0·314	− 1·839	54·191	9·7972919	5·1526031	See Δ 51.
Sum...............		180· 0· 8·910	−2·451	− 8·910	0·000		Feet.	
180+ε.		180· 0· 6·459					224513·16	
Error..............		+2·451					142102·95	

§ 6.

NAMES OF STATIONS.	Nos. of the Angles.	ANGLES.	Corrections to the Angles.	Corrections $-\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	REFERENCES.
△ 51.—King's Battery to Riebeek's Kasteel = 248167·26 Feet...Log. 5·3947445. (From △ 49.)								
Simon's Berg...............	120+121	96° 5′ 48″·31	+″·157	− 1″·944	46″·366	9·9975371		
King's Battery............	127−126	49·11·53·08	− ·420	− 2·522	50·558	9·8790759	5·2762833	See △'s 43,44,48.
Riebeek's Kasteel..........	33−30	34·42·25·10	+ ·078	− 2·024	23·076	9·7553957	5·1526031	See △ 50.
Sum...............		180· 0· 6·490	− ·185	− 6·490	0·000		Feet.	
180+ε.		180· 0· 6·305					188922·35	
Error.............		+0·185					142102·95	
△ 52.—Royal Observatory to Kapoc Berg = 189298·47 Feet...Log. 5·2771471. (From △ 46.)								
Sneeuw Kop.................	138	37·59·42·13	+ ·837	− 1·363	40·767	9·7892902		
Royal Observatory	112	111· 3· 1·66	+ ·938	− 1·262	0·398	9·9700058	5·4578627	See △'s 53, 54.
Kapoc Berg................	19	30·57·20·91	+ ·125	− 2·075	18·835	9·7112741	5·1991310	
Sum...............		180· 0· 4·700	+1·900	− 4·700	0·000		Feet.	
180+ε.		180· 0· 6·600					286987·30	
Error..............		−1·900					158172·51	
△ 53.—King's Battery to Kapoc Berg = 194256·21 Feet...Log. 5·2883749. (From △ 49.)								
Sneeuw Kop.................	137	40·37·30·22	+ ·062	− 2·360	27·860	9·8136461		
King's Battery............	128	105·51·56·65	− ·202	− 2·625	54·025	9·9831338	5·4578626	See △'s 52, 54.
Kapoc Berg................	18	33·30·39·75	+ ·788	− 1·625	38·115	9·7420108	5·2167396	
Sum...............		180· 0· 6·620	+ ·648	− 6·620	0·000		Feet.	
180+ε.		180· 0· 7·268					286987·24	
Error..............		−0·648					164717·45	
△ 54.—Kapoc Berg to Winter Berg = 255508·12 Feet...Log. 5·4074047. (From △ 22.)								
Sneeuw Kop.................	136	46·56·49·07	−1·045	− 6·689	42·381	9·8637391		
Kapoc Berg.................	21	77·53·57·41	−0·523	− 6·168	51·242	9·9902386	5·5339042	
Winter Berg................	144	55· 9·32·39	−0·368	− 6·013	26·377	9·9141971	5·4578627	See △'s 52, 53.
Sum..............		180· 0·18·870	−1·936	−18·870	0·000		Feet.	
180+ε.		180· 0·16·934					341904·02	
Error.............		+1·936					286987·30	
△ 55.—Royal Observatory to Sneeuw Kop = 158172·51 Feet...Log. 5·1991310. (From △ 52.)								
Zwart Kop	148	63·11·52·22	− ·125	− 1·429	50·791	9·9506402		
Royal Observatory........	114	79·54·10·43	+ ·056	− 1·248	9·182	9·9932206	5·2417114	See △ 56.
Sneeuw Kop.................	141	36·54· 1·86	− ·528	− 1·833	0·027	9·7784554	5·0269462	See △ 57.
Sum...............		180· 0· 4·510	− ·597	− 4·510	0·000		Feet.	
180+ε.		180· 0· 3·913					174466·23	
Error.............		+0·597					106401·13	

§ 6.

NAMES OF STATIONS.	Nos. of the Angles.	ANGLES.	Corrections to the Angles.	Cor-rections $-\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	REFERENCES.
Δ 56.—King's Battery to Sneeuw Kop = 164717·45 Feet...Log. 5·2167396. (From Δ 53.)								
Zwart Kop..................	146	67° 32′ 22″·00	− ″·296	− 1″·569	20″·431	9·9657377		
King's Battery.............	133	78·11·29·08	− ·979	− 2·253	26·827	9·9907092	5·2417111	See Δ 55.
Sneeuw Kop..................	140	34·16·13·77	+ ·246	− 1·028	12·742	9·7505827	5·0015846	See Δ 58.
Sum...............		180· 0· 4·850	−1·029	− 4·850	0·000		Feet.	
180+ε.		180· 0· 3·821					174466·10	
Error.............		+1·029					100365·53	
Δ 57.—Royal Observatory to Simon's Berg = 133099·24 Feet...Log. 5·1241756. (From Δ 47.)								
Zwart Kop..................	149	42·39·59·35	−0·331	− 1·410	57·940	9·8310533		
Royal Observatory........	113	104·31·47·08	−1·839	− 2·918	44·162	9·9858848	5·2790071	See Δ 58.
Simon's Berg...............	125	32·48·19·34	−0·362	− 1·442	17·898	9·7338239	5·0269462	See Δ 55.
Sum...............		180· 0· 5·770	−2·532	− 5·770	0·000		Feet.	
180+ε.		180· 0· 3·238					190110·92	
Error.............		+2·532					106401·13	
Δ 58.—King's Battery to Simon's Berg = 142102·95 Feet...Log. 5·1526031. (From Δ 50.)								
Zwart Kop..................	145	47· 0·29·13	− ·502	− 1·600	27·530	9·8641815		
King's Battery.............	130	101·53·15·53	− ·476	− 1·575	13·955	9·9905852	5·2790068	See Δ 57.
Simon's Berg...............	124	31· 6·19·73	− ·116	− 1·215	18·515	9·7131630	5·0015846	See Δ 56.
Sum...............		180· 0· 4·390	−1·094	− 4·390	0·000		Feet.	
180+ε.		180· 0· 3·296					190110·79	
Error........		+1·094					100365·53	
Δ 59.—King's Battery to Simon's Berg = 142102·95 Feet...Log. 5·1526031. (From Δ 50.)								
Cape Point..................	151	40· 8· 5·82	−1·725	− 3·348	2·472	9·8092753		
King's Battery.............	131	98·11·10·78	+ ·540	− 1·083	9·697	9·9955523	5·3388801	
Simon's Berg...............	119	41·40·49·30	+ ·155	− 1·469	47·831	9·8228014	5·1661292	See Δ 60.
Sum...............		180· 0· 5·900	−1·030	− 5·900	0·000		Feet.	
180+ε.		180· 0· 4·870					218212·75	
Error.............		+1·030					146598·38	
Δ 60.—King's Battery to Sneeuw Kop = 164717·45 Feet...Log. 5·2167396. (From Δ 53.)								
Cape Point..................	152	57· 7·60·04	+ ·035	− 1·796	58·244	9·9242436		
King's Battery.............	132	74·29·24·33	+ ·037	− 1·794	22·536	9·9838886	5·2763846	
Sneeuw Kop................	134	48·22·40·77	+ ·282	− 1·550	39·220	9·8736333	5·1661293	See Δ 59.
Sum...............		180· 0· 5·140	+ ·354	− 5·140	0·000		Feet.	
180+ε.		180· 0· 5·494					188966·39	
Error.............		−0·354					146598·42	

§ 6.

NAMES OF STATIONS.	Nos. of the Angles.	ANGLES.	Corrections to the Angles.	Corrections $-\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	REFERENCES.
△ 61.—Royal Observatory to Sneeuw Kop = 158172·51 Feet...Log. 5·1991310. (From △ 52.)								
Meridian Mark............	117	55° 28′ 34″·51	− ″·163	− ″·990	33″·520	9·9158685		
Royal Observatory........	109	103·38·51·57	− ·153	− ·981	50·589	9·9875618	5·2708243	See △'s 62,63,64.
Sneeuw Kop................	139	20·52·37·50	− ·781	− 1·609	35·891	9·5518853	4·8351478	
Sum...............		180· 0· 3·580	−1·097	− 3·580	0·000		Feet.	
180+ε.		180· 0· 2·483					186562·49	
Error.............		+1·097					68414·44	
△ 62.—King's Battery to Sneeuw Kop = 164717·45 Feet...Log. 5·2167396. (From △ 53.)								
Meridian Mark............	115	61·36·22·89	− ·631	− 1·595	21·295	9·9443334		
King's Battery............	129	94·53·16·71	− ·110	− 1·075	15·635	9·9984179	5·2708241	See △'s 61,63,64.
Sneeuw Kop................	135−134	23·30·25·59	−1·555	− 2·520	23·070	9·6008113	4·8732175	
Sum...............		180· 0· 5·190	−2·296	− 5·190	0·000		Feet.	
180+ε.		180· 0· 2·894					186562·40	
Error.............		+2·296					74682·27	
△ 63.—Zwart Kop to Sneeuw Kop = 174466·14 Feet...Log. 5·2417112. (From △'s 55, 56.)								
Meridian Mark............	118	57·38·15·53	− ·998	− 3·165	12·365	9·9266879		
Zwart Kop..................	147	64·35·14·39	− ·469	− 2·637	11·753	9·9558008	5·2708241	See △'s 61,62,64.
Sneeuw Kop................	139+141	57·46·39·36	−1·310	− 3·478	35·882	9·9273579	5·2423812	
Sum...............		180· 0· 9·280	−2·777	− 9·280	0·000		Feet.	
180+ε.		180· 0· 6·503					186562·40	
Error.............		+2·777					174735·52	
△ 64.—Cape Point to Sneeuw Kop = 188966·39 Feet...Log. 5·2763846. (From △ 60.)								
Meridian Mark............	116	54·33·53·43	− ·772	− 3·409	50·021	9·9110311		
Cape Point..................	150	53·33· 9·38	+ ·788	− 1·850	7·530	9·9054706	5·2708241	See △'s 61,62,63.
Sneeuw Kop................	135	71·53· 6·36	−1·273	− 3·911	2·449	9·9779197	5·3432732	
Sum...............		180· 0· 9·170	−1·257	− 9·170	0·000		Feet.	
180+ε.		180· 0· 7·913					186562·40	
Error.............		+1·257					220431·27	

CALCULATION

OF THE

SECONDARY TRIANGLES.

NOTE.—Where an asterisk * is affixed to the name of a Station it denotes that the angle was not measured, but that it is inferred from the other two angles.

§ 6.

NAMES OF STATIONS.	WEIGHT.	ANGLES.	Proportion of Error.	Corrections $-\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	REFERENCES.
△ 65.—King's Battery to Meridian Mark = 74682·27 Feet...Log. 4·8732175. (From △ 62.)								
Tyger Berg	23·8	89° 15′ 51″·48	−0″·16	−0″·39	51″·09	9·9999642		
King's Battery	4·0	43·45·41·11	−0·92	−1·14	39·97	9·8398882	4·7131415	See △ 66.
Meridian Mark	4·9	46·58·29·91	−0·75	−0·97	28·94	9·8639486	4·7372019	
Sum		180· 0· 2·50	−1·83	−2·50	0·00		Feet.	
180+ε.		180· 0· 0·67					51658·46	
Error		+1·83					54601·16	
△ 66.—Royal Observatory to Meridian Mark = 68414·44 Feet...Log. 4·8351478. (From △ 61.)								
Tyger Berg	20·0	90· 7·21·06	+0·14	−0·05	21·01	9·9999990		
Royal Observatory	13·4	49· 1·56·75	+0·20	+0·02	56·77	9·8779935	4·7131423	See △ 65.
Meridian Mark	6·9	40·50·42·00	+0·40	+0·22	42·22	9·8155882	4·6507370	
Sum		179·59·59·81	+0·74	+0·19	0·00		Feet.	
180+ε.		180· 0· 0·55					51658·56	
Error		−0·74					44744·23	
△ 67.—Cape Point to Sneeuw Kop = 188966·39 Feet...Log. 5·2763846. (From △ 60.)								
Tyger Berg	12·4	70·24·47·40	+0·37	−1·50	45·90	9·9741118		
Cape Point	79·5	43· 9·38·88	+0·06	−1·81	37·07	9·8350827	5·1373555	
Sneeuw Kop	53·0	66·25·38·81	+0·09	−1·78	37·03	9·9621566	5·2644294	
Sum		180· 0· 5·09	+0·52	−5·09	0·00		Feet.	
180+ε.		180· 0· 5·61					137200·44	
Error		−0·52					183835·51	
△ 68.—Cape Point to King's Battery = 146598·42 Feet...Log. 5·1661293. (From △ 60.)								
Kogel Berg	40·0	57·47·58·89	−0·25	−1·67	57·22	9·9274658		
Cape Point	12·0	74·36·57·54	−0·81	−2·24	55·30	9·9841521	5·2228156	
King's Battery	17·7	47·35· 9·46	−0·56	−1·98	7·48	9·8682232	5·1068867	
Sum		180· 0· 5·89	−1·62	−5·89	0·00		Feet.	
180+ε.		180· 0· 4·27					167038·12	
Error		+1·62					127904·77	
△ 69.—Zwart Kop to Royal Observatory = 106401·13 Feet...Log. 5·0269462. (From △ 55.)								
Kogel Berg	40·0	40·13·17·00	−0·03	−1·12	15·88	9·8100568		
Zwart Kop	24·1	87·27 44·72	−0·05	−1·14	43·58	9·9995739	5·2164633	See △ 70.
Royal Observatory	21·5	52·19· 1·69	−0·06	−1·15	0·54	9·8983977	5·1152871	
Sum		180· 0· 3·41	−0·14	−3·41	0·00		Feet.	
180+ε.		180· 0· 3·27					164612·68	
Error		+0·14					130402·84	

§ 6.

NAMES OF STATIONS.	WEIGHT.	ANGLES.	Proportion of Error.	Corrections −⅓ ε.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	REFERENCES.
Δ 70.—Sneeuw Kop to Royal Observatory = 158172·51 Feet...Log. 5·1991310. (From Δ 52.)								
Kogel Berg..................	40·0	71°33′42″·84	+0″·30	− 0″·65	42″·19	9·9771128		
Sneeuw Kop................	12·7	80·51· 9·55	+0·95	0·00	9·55	9·9944416	5·2164598	See Δ 69.
Royal Observatory........	30·8	27·35· 8·80	+0·41	− 0·54	8·26	9·6656501	4·8876683	See Δ 71.
Sum...............		180· 0· 1·19	+1·66	− 1·19	0·00		Feet.	
180+ε.		180· 0· 2·85					164611·36	
Error.............		−1·66					77209·07	
Δ 71.—Sneeuw Kop to King's Battery = 164717·45 Feet...Log. 5·2167396. (From Δ 53.)								
Kogel Berg..................	40·0	74·52·24·48	+0·45	− 0·53	23·95	9·9846854		
Sneeuw Kop................	46·0	78·13·22·23	+0·39	− 0·59	21·64	9·9907598	5·2228140	See Δ 68.
King's Battery............	34·8	26·54·14·87	+0·52	− 0·46	14·41	9·6556157	4·8876699	See Δ 70.
Sum		180· 0· 1·58	+1·36	− 1·58	0·00		Feet.	
180+ε.		180· 0· 2·94					167037·50	
Error.............		−1·36					77209·35	
Δ 72.—Tyger Berg to Sneeuw Kop = 137204·41 Feet...Log. 5·1373555 (From Δ 67.)								
Kogel Berg..................	50·0	55·56·23·94	+0·18	− 0·65	23·29	9·9182661		
Tyger Berg..................	7·1	27·47·16·79	+1·28	+ 0·45	17·24	9·6685753	4·8876647	See Δ's 70, 71.
Sneeuw Kop.................	29·0	96·16·19·99	+0·31	− 0·52	19·47	9·9973926	5·2164820	See Δ 73.
Sum...............		180· 0· 0·72	+1·77	− 0·72	0·00		Feet.	
180+ε.		180· 0· 2·49					77208·44	
Error........		−1·77					164619·76	
Δ 73.—Cape Point to Tyger Berg = 183835·51 Feet...Log. 5·2644294. (From Δ 67.)								
Kogel Berg..................	25·0	76·43·59·43	−0·31	− 1·93	57·50	9·9882511		
Cape Point..................	13·0	60·38·36·34	−0·59	− 2·20	34·14	9·9403075	5·2164858	See Δ 72.
Tyger Berg..................	12·1	42·37·30·61	−0·64	− 2·25	28·36	9·8307113	5·1068896	See Δ 68.
Sum..............		180· 0· 6·38	−1·54	− 6·38	0·00		Feet.	
180+ε.		180· 0· 4·84					164621·21	
Error.............		+1·54					127905·62	
Δ 74.—Cape Point to Sneeuw Kop = 188966·39 Feet...Log. 5·2763846. (From Δ 60.)								
Danger Point...............	12·6	41·36·49·52	+0·88	− 2·59	46·93	9·8222311		
Cape Point..................	65·2	55·39·34·47	+0·17	− 3·30	31·17	9·9168178	5·3709713	
Sneeuw Kop................	119·0	82·43·45·27	+0·09	− 3·37	41·90	9·9964929	5·4506464	
Sum..............		180· 0· 9·26	+1·14	− 9·26	0·00		Feet.	
180+ε.		180· 0·10·40					234947·77	
Error.............		−1·14					282258·13	

§ 6.

NAMES OF STATIONS.	WEIGHT.	ANGLES.	Proportion of Error.	Corrections $-\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	REFERENCES.
△ 75.—Danger Point to Sneeuw Kop = 234947·76 Feet...Log. 5·3709713. (From △ 74.)								
Zondereinde Berg.........	72·5	55°24′46″·03	+0″·05	− 4″·04	41″·99	9·9155328		
Danger Point..............	29·2	67·22·36·01	+0·13	− 3·97	32·04	9·9652234	5·4206619	
Sneeuw Kop................	119·0	57·12·50·04	+0·03	− 4·07	45·97	9·9246345	5·3800730	
Sum..............		180· 0·12·08	+0·21	−12·08	0·00		Feet.	
180+ε.		180· 0·12·29					263428·00	
Error............		−0·21					239923·60	
△ 76.—Danger Point to Zondereinde Berg = 239923·60 Feet...Log. 5·3800730. (From △ 75.)								
Cape L'Agulhas...........	9·8	57· 2·25·15	−0·39	− 4·18	20·97	9·9237841		
Danger Point..............	9·9	76·49· 5·82	−0·38	− 4·17	1·65	9·9884016	5·4446905	
Zondereinde Berg.........	72·0	46· 8·41·22	−0·05	− 3·84	37·38	9·8579835	5·3142724	
Sum..............		180· 0·12·19	−0·82	−12·19	0·00		Feet.	
180+ε.		180· 0·11·37					278413·64	
Error............		+0·82					206192·29	
△ 77.—Cape L'Agulhas to Zondereinde Berg = 278413·64 Feet...Log. 5·4446905. (From △ 76.)								
Pot Berg...................*		71·41·23·46		− 4·22	19·24	9·9774325		
Cape L'Agulhas...........	91·0	55·42· 4·88		− 4·22	0·66	9·9170327	5·3842907	
Zondereinde Berg.........	62·0	52·36·44·32		− 4·22	40·10	9·9001118	5·3673698	
Sum..............		180· 0·12·66		−12·66	0·00		Feet.	
180+ε.							242265·00	
Error............							233007·43	
△ 78.—Cape Point to Sneeuw Kop = 188966·39 Feet...Log. 5·2763846. (From △ 60.)								
Mudge Point...............	190·7	64·40·49·40	+ ·02	− 1·98	47·42	9·9561358		
Cape Point.................	4·0	42·22·27·79	+ ·92	− 1·08	26·71	9·8286395	5·1488883	
Sneeuw Kop................	15·0	72·56·47·64	+ ·24	− 1·77	45·87	9·9804711	5·3007199	
Sum..............		180· 0· 4·83	+1·18	− 4·83	0·00		Feet.	
180+ε.		180· 0· 6·01					140892·62	
Error............		−1·18					199857·23	
△ 79.—Cape Point to Kogel Berg = 127904·77 Feet...Log. 5·1068867. (From △ 68.)								
Mudge Point...............	5·0	32·42·30·42	+ ·84	− 0·01	30·41	9·7326867		
Cape Point.................	4·0	24·53·30·33	+1·04	+ 0·19	30·52	9·6241853	4·9983853	See △ 80.
Kogel Berg.................	22·0	122·23·59·72	+ ·19	− 0·65	59·07	9·9265124	5·3007124	See △ 78.
Sum..............		180· 0· 0·47	+2·07	− 0·47	0·00		Feet.	
180+ε.		180· 0· 2·54					99628·89	
Error............		−2·07					199853·78	

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△ 80.—Kogel Berg to Sneeuw Kop = 77209·21 Feet...Log. 4·8876691. (From △'s 70 and 71.)

NAMES OF STATIONS.	WEIGHT.	ANGLES.	Proportion of Error.	Corrections −⅓ ε.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	REFERENCES.
Mudge Point	5·0	31°58′18″·98	− ″·43	− ″1·02	17″·96	9·7238657		
Kogel Berg	40·0	104·55·36·91	− ·05	− 0·64	36·27	9·9850922	5·1488956	See △ 78.
Sneeuw Kop	20·0	43· 6· 6·46	− ·11	− 0·69	5·77	9·8346078	4·9984112	See △ 79.
Sum		180· 0· 2·35	− ·59	− 2·35	0·00		Feet.	
180+ε.		180· 0· 1·76					140895·00	
Error		+0·59					99634·82	

△ 81.—Kogel Berg to Sneeuw Kop = 77209·21 Feet...Log. 4·8876691. (From △'s 70 and 71.)

NAMES OF STATIONS.	WEIGHT.	ANGLES.	Proportion of Error.	Corrections −⅓ ε.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	REFERENCES.
Babylon's Tower	0·5	33· 7·51·00	− ·50	− 1·26	49·74	9·7376280		
Kogel Berg	0·5	83· 3·15·73	− ·50	− 1·27	14·46	9·9968008	5·1468419	See △ 82.
Sneeuw Kop	0·5	63·48·57·06	− ·50	− 1·26	55·80	9·9529753	5·1030164	
Sum		180· 0· 3·79	−1·50	− 3·79	0·00		Feet.	
180+ε.		180· 0· 2·29					140230·32	
Error		+1·50					126769·97	

△ 82.—Sneeuw Kop to Zonder Einde Berg = 263428·00 Feet...Log. 5·4206619. (From △ 75.)

NAMES OF STATIONS.	WEIGHT.	ANGLES.	Proportion of Error.	Corrections −⅓ ε.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	REFERENCES.
Babylon's Tower	82·3	102·23·28·62	+ ·20	− 1·90	26·72	9·9897642		
Sneeuw Kop	15·0	46·16·57·07	+1·07	− 1·03	56·04	9·8589898	5·2898875	See △ 83.
Zonder Einde Berg	42·0	31·19·38·95	+ ·39	− 1·71	37·24	9·7159381	5·1468358	See △ 81.
Sum		180· 0· 4·64	+1·66	− 4·64	0·00		Feet.	
180+ε.		180· 0· 6·30					194933·94	
Error		−1·66					140228·36	

△ 83.—Zonder Einde Berg to Danger Point = 239923·60 Feet...Log. 5·3800730. (From △ 75.)

NAMES OF STATIONS.	WEIGHT.	ANGLES.	Proportion of Error.	Corrections −⅓ ε.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	REFERENCES.
Babylon's Tower	168·1	103·49·47·25	− ·02	− 1·53	45·72	9·9872245		
Zonder Einde Berg	54·0	24· 5· 7·08	− ·05	− 1·55	5·53	9·6107553	5·0036038	
Danger Point	1·0	52· 5·12·92	−2·67	− 4·17	8·75	9·8970393	5·2898878	See △ 82.
Sum		180· 0· 7·25	−2·74	− 7·25	0·00		Feet.	
180+ε.		180· 0· 4·51					100833·26	
Error		+2·74					194934·09	

△ 84.—Babylon's Tower to Sneeuw Kop = 140229·34 Feet...Log. 5·1468389. (From △'s 81, 82.)

NAMES OF STATIONS.	WEIGHT.	ANGLES.	Proportion of Error.	Corrections −⅓ ε.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	REFERENCES.
Zwart Berg (Caledon)...*		58·16·31·48		− 0·87	30·61	9·9297169		
Babylon's Tower		93·12·41·93		− 0·86	41·07	9·9993175	5·2164395	
Sneeuw Kop		28·30·49·19		− 0·87	48·32	9·6788502	4·8959722	See △ 85.
Sum		180· 0· 2·60		− 2·60	0·00		Feet.	
180+ε.							164603·68	
Error							78699·54	

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NAMES OF STATIONS.	WEIGHT.	ANGLES.	Proportion of Error.	Corrections $-\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	REFERENCES.
△ 85.—Danger Point to Babylon's Tower = 100833·26 Feet...Log. 5·0036038. (From △ 83.)								
Zwart Berg (Caledon)...*		° ′ ″ 38· 9·32·50	″	″ — ·57	″ 31·93	9·7908789		See △ 84.
Danger Point...............		28·49·57·76		— ·57	57·19	9·6832735	4·8959984	
Babylon's Tower..........		113· 0·31·46		— ·58	30·88	9·9639985	5·1767234	
180+ε.		180· 0· 1·72		— 1·72	0·00		Feet.	
							78704·29	
							150218·48	
△ 86.—Babylon's Tower to Zondereinde Berg = 194934·02 Feet...Log. 5·2898877. (From △'s 82&83.)								
Gunner's Quoin..........*		50·50·55·58		— 2·72	52·86	9·8895672		
Babylon's Tower...........		84· 0·12·51		— 2·72	9·79	9·9976165	5·3979370	
Zondereinde Berg.........		45· 9· 0·07		— 2·72	57·35	9·8506134	5·2509339	
180+ε.		180· 0· 8·16		— 8·16	0·00		Feet.	
							249998·29	
							178210·74	
△ 87.—Kogel Berg to Cape Point = 127904·77 Feet...Log. 5·1068867. (From △ 68.)								
Cape Hanglip, pile.......*		107· 8·59·68		— ·40	59·28	9·9802475		
Kogel Berg..................		49·54·18·34		— ·40	17·94	9·8836486	5·0102878	
Cape Point..................		22·56·43·19		— ·41	42·78	9·5908984	4·7175376	
180+ε.		180· 0· 1·21		— 1·21	0·00		Feet.	
							102397·12	
							52184·02	
△ 88.—King's Battery to Cape Point = 146598·42 Feet...Log. 5·1661293. (From △ 60.)								
Cape Hanglip, knob......*		50·10·60·06		— 1·17	58·89	9·8854143		
King's Battery............		32·29·21·33		— 1·17	20·16	9·7300848	5·0107998	
Cape Point..................		97·19·42·13		— 1·18	40·95	9·9964382	5·2771532	
180+ε.		180· 0· 3·52		— 3·52	0·00		Feet.	
							102517·92	
							189301·13	
△ 89.—Sneeuw Kop to Tyger Berg = 137200·44 Feet...Log. 5·1373555. (From △ 67.)								
Noah's Ark.................*		52·17·28·46		— 1·38	27·08	9·8982456		
Sneeuw Kop................		48·25·58·29		— 1·38	56·91	9·8740027	5·1131126	
Tyger Berg.................		79·16·37·38		— 1·37	36·01	9·9923490	5·2314589	
180+ε.		180· 0· 4·13		— 4·13	0·00		Feet.	
							129751·6	
							170395·8	

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NAMES OF STATIONS.	WEIGHT.	ANGLES.	Proportion of Error.	Corrections $-\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	REFERENCES.
△ 90.—Sneeuw Kop to Tyger Berg = 137200·44 Feet...Log. 5·1373555. (From △ 67.)								
Naval Yard Station......*		° ′ ″ 49·57· 4·28	″	″ −1·42	″ 2·86	9·8839407		
Sneeuw Kop..................		47·31· 9·77		−1·42	8·35	9·8677627	5·1211775	
Tyger Berg..................		82·31·50·20		−1·41	48·79	9·9962986	5·2497134	
180+ε.		180· 0· 4·25		−4·25	0·00		Feet.	
							132183·6	
							177710·6	
△ 91.—Kogel Berg to Tyger Berg = 164619·76 Feet...Log. 5·2164820. (From △ 72.)								
Admiralty House.........*		74·42·52·41		−1·39	51·02	9·9843574		
Tyger Berg..................		55· 1·11·51		−1·39	10·12	9·9134679	5·1455925	
Kogel Berg..................		50·16· 0·26		−1·40	58·86	9·8859400	5·1180646	
180+ε.		180· 0· 4·18		−4·18	0·00		Feet.	
							139827·5	
							131239·5	
△ 92.—Kogel Berg to Tyger Berg = 164619·76 Feet...Log. 5·2164820. (From △ 72.)								
Naval Yard, clock tower*		74·32·21·48		−1·40	20·08	9·9839922		
Tyger Berg..................		54·41·40·36		−1·40	38·96	9·9117320	5·1442218	
Kogel Berg..................		50·46· 2·36		−1·40	0·96	9·8890660	5·1215558	
180+ε.		180· 0· 4·20		−4·20	0·00		Feet.	
							139386·8	
							132298·8	
△ 93.—King's Battery to Simon's Berg = 142102·95 Feet...Log. 5·1526031. (From △ 50.)								
Muizenberg................*		60·24·13·17		−0·60	12·57	9·9392821		
King's Battery..............		100· 4·45·95		−0·60	45·35	9·9932451	5·2065661	See △ 94.
Simon's Berg...............		19·31· 2·68		−0·60	2·08	9·5238642	4·7371852	
180+ε.		180· 0· 1·80		−1·80	0·00		Feet.	
							160903·7	
							54599·1	
△ 94.—Royal Observatory to Simon's Berg = 133099·24 Feet...Log. 5·1241756. (From △ 47.)								
Muizenberg................*		52·36· 2·54		−0·61	1·93	9·9000503		
Royal Observatory		106·10·57·24		−0·61	56·63	9·9824428	5·2065681	See △ 93.
Simon's Berg...............		21·13· 2·05		−0·61	1·44	9·5585913	4·7827166	
180+ε.		180· 0· 1·83		−1·83	0·00		Feet.	
							160904·5	
							60634·1	

§ 6.

NAMES OF STATIONS.	WEIGHT.	ANGLES.	Proportion of Error.	Corrections $-\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	REFERENCES.
△ 95.—Kapoc Berg to Simon's Berg = 224513·21 Feet...Log. 5·3512419. (From △ 47.)								
Table Mountain, pile....*		78° 15′ 8″·22	″	— 2″·32	5″·90	9·9908055		
Kapoc Berg..................		41·10·55·57		— 2·32	53·25	9·8185201	5·1789565	See △ 97.
Simon's Berg...............		60·34· 3·18		— 2·33	0·85	9·9399833	5·3004197	See △ 98.
180+ε.		180· 0· 6·97		— 6·97	0·00		Feet.	
							150992·9	
							199719·1	
△ 96.—Sneeuw Kop to Zwart Kop = 174466·16 Feet...Log. 5·2417112. (From △'s 55 & 56.)								
Table Mountain, pile....*		75·55·50·11		— 1·24	48·87	9·9867719		
Sneeuw Kop.................		31·49· 2·61		— 1·24	1·37	9·7219826	4·9769219	
Zwart Kop..................		72·15·11·00		— 1·24	9·76	9·9788240	5·2337633	See △'s 98, 99, and 102.
180+ε.		180· 0· 3·72		— 3·72	0·00		Feet.	
							94824·8	
							171302·3	
△ 97.—Simon's Berg to Cape Point = 218212·75 Feet...Log. 5·3388801. (From △ 59.)								
Table Mountain, pile....*		96·26·59·18		— 1·67	57·51	9·9972429		
Simon's Berg...............		40· 6·46·83		— 1·67	45·16	9·8090821	5·1507193	See △ 99.
Cape Point..................		43·26·19·00		— 1·67	17·33	9·8373176	5·1789548	See △ 95.
180+ε.		180· 0· 5·01		— 5·01	0·00		Feet.	
							141487·9	
							150992·3	
△ 98.—Kapoc Berg to Sneeuw Kop = 286987·30 Feet...Log. 5·4578627. (From △ 52.)								
Table Mountain, pile....*		101· 3·47·31		— 2·64	44·67	9·9918543		[and 102.
Kapoc Berg..................		35·51·39·29		— 2·64	36·65	9·7677562	5·2337646	See △'s 96, 99,
Sneeuw Kop.................		43· 4·41·33		— 2·65	38·68	9·8344117	5·3004201	See △ 95.
180+ε.		180· 0· 7·93		— 7·93	0·00		Feet.	
							171302·8	
							199719·3	
△ 99.—Sneeuw Kop to Cape Point = 188966·39 Feet...Log. 5·2763846. (From △ 60.)								
Table Mountain, pile....*		73·38·20·85		— 1·83	19·02	9·9820468		
Sneeuw Kop.................		45·55·29·66		— 1·83	27·83	9·8563800	5·1507178	See △ 97.
Cape Point..................		60·26·14·98		— 1·83	13·15	9·9394262	5·2337640	See △'s 96, 98, and 102.
180+ε.		180· 0· 5·49		— 5·49	0·00		Feet.	
							141487·4	
							171302·6	

NAMES OF STATIONS.	WEIGHT.	ANGLES.	Proportion of Error.	Corrections $-\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	REFERENCES.
△ 100.—Sneeuw Kop to Kogel Berg = 77209·21 Feet...Log. 4·8876691. (From △'s 70 and 71.)								
Table Mountain, pile....*		26° 9′ 59″·24	″	−1″·01	58″·23	9·6444150		
Sneeuw Kop..................		75·46·10·84		−1·01	9·83	9·9864646	5·2297187	See △ 101.
Kogel Berg..................		78· 3·52·95		−1·01	51·94	9·9905079	5·2337620	See △'s 96, 98, 99, and 102.
180+ε.		180· 0· 3·03		−3·03	0·00		Feet.	
							169714·4	
							171301·8	
△ 101.—Kogel Berg to Cape Point = 127904·77 Feet...Log. 5·1068867. (From △ 68.)								
Table Mountain, pile....*		47·28·21·32		−1·39	19·93	9·8674378		
Kogel Berg..................		54·36·30·42		−1·39	29·03	9·9112691	5·1507180	See △'s 97 & 99.
Cape Point..................		77·55·12·44		−1·40	11·04	9·9902746	5·2297235	See △ 100.
180+ε.		180· 0· 4·18		−4·18	0·00		Feet.	
							141487·5	
							169716·3	
△ 102.—Blaauw Berg to Sneeuw Kop = 186562·45 Feet...Log. 5·2708242. (From △'s 61 & 62.)								
Table Mountain, pile....*		87·30· 6·63		−1·10	5·53	9·9995870		[and 99.
Blaauw Berg................		66·32·21·41		−1·10	20·31	9·9625261	5·2337633	See △'s 96, 98,
Sneeuw Kop.................		25·57·35·26		−1·10	34·16	9·6412118	4·9124490	See △ 103.
180+ε.		180· 0· 3·30		−3·30	0·00		Feet.	
							171302·3	
							81742·7	
△ 103.—Tyger Berg to Blaauw Berg = 51658·51 Feet...Log. 4·7131419. (From △'s 65 & 66.)								
Table Mountain, pile....*		39·11·12·43		−0·26	12·17	9·8006137		
Tyger Berg..................		88·54·19·29		−0·26	19·03	9·9999207	4·9124489	See △ 102.
Blaauw Berg................		51·54·29·06		−0·26	28·80	9·8959864	4·8085146	
180+ε.		180· 0· 0·78		−0·78	0·00		Feet.	
							81742·7	
							64345·0	
△ 104.—Tyger Berg to Blaauw Berg = 51658·51 Feet...Log. 4·7131419. (From △'s 65 & 66.)								
Lion's Rump, signal staff	2·0	47·54·36·80	−1·56	−1·79	35·01	9·8704563		
Tyger Berg..................	2·0	71·28·10·33	−1·57	−1·80	8·53	9·9768780	4·8195636	
Blaauw Berg................	2·0	60·37·18·26	−1·56	−1·80	16·46	9·9402155	4·7829011	
Sum...............		180· 0· 5·39	−4·69	−5·39	0·00		Feet.	
180+ε.		180· 0· 0·70					66003·0	
Error..............		+4·69					60659·8	

§ 6.

NAMES OF STATIONS.	WEIGHT.	ANGLES.	Proportion of Error.	Corrections $-\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	REFERENCES.
△ 105.—Kapoc Berg to Riebeek's Kasteel = 135773·25 Feet...Log. 5·1328142. (From △ 2.)								
Robben Island, ch. tower*		° ′ ″ 37·21·23·16	″	″ − 1·49	″ 21·67	9·7830211		
Kapoc Berg..................		102·56·13·59		− 1·49	12·10	9·9888344	5·3386275	
Riebeek's Kasteel..........		39·42·27·72		− 1·49	26·23	9·8054096	5·1552027	
180+ε.		180· 0· 4·47		− 4·47	0·00		Feet. 218085·8 142956·1	
△ 106.—King's Battery to Tyger Berg = 54601·16 Feet...Log. 4·7372019. (From △ 65.)								
Robben Island, ch. tower*		52·56· 8·12		− 0·23	7·89	9·9019799		
King's Battery.............		73·14·31·47		− 0·23	31·24	9·9811529	4·8163749	See △ 107.
Tyger Berg..................		53·49·21·09		− 0·22	20·87	9·9069767	4·7421987	
180+ε.		180· 0· 0·68		− 0·68	0·00		Feet. 65520·2 55233·0	
△ 107.—Royal Observatory to Tyger Berg = 44744·23 Feet...Log. 4·6507370. (From △ 66.)								
Robben Island, ch. tower*		42·38· 8·98		− 0·19	8·79	9·8308038		
Royal Observatory........		82·41· 0·91		− 0·19	0·72	9·9964494	4·8163826	See △ 106.
Tyger Berg..................		54·40·50·67		− 0·18	50·49	9·9116597	4·7315929	
180+ε.		180· 0· 0·56		− 0·56	0·00		Feet. 65521·3 53900·5	
△ 108.—Kapoc Berg to Ea t End of Base = 75768·48 Feet...Log. 4·8794886. (From △ 1.)								
Groote Zwart Berg......*		50· 6· 1·61		− 0·48	1·13	9·8848908		
Kapoc Berg..................		62·56·26·85		− 0·48	26·37	9·9496514	4·9442492	
East End of Base..........		66·57·32·99		− 0·49	32·50	9·9638941	4·9584919	See △ 109.
180+ε.		180· 0· 1·45		− 1·45	0·00		Feet. 87952·7 90884·9	
△ 109.—Kapoc Berg to Riebeek's Kasteel = 135773·25 Feet...Log. 5·1328142. (From △ 2.)								
Groote Zwart Berg......*		39·18·44·25		− 0·88	43·37	9·8017766		
Kapoc Berg..................		115·35·41·62		− 0·88	40·74	9·9551454	5·2861830	
Riebeek's Kasteel..........		25· 5·36·76		− 0·87	35·89	9·6274617	4·9584993	See △ 108.
180+ε.		180· 0· 2·63		− 2·63	0·00		Feet. 193278·3 90886·5	

△ 110.—Eland's Berg to Lambert's Hoek Berg = 134570·87 Feet...Log. 5·1289511. (From △ 14.)

NAMES OF STATIONS.	WEIGHT.	ANGLES.	Proportion of Error.	Corrections $-\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	REFERENCES.
Lambert's Bay............*		° ′ ″ 52·25·24·34	″	″ − 0·93	″ 23·41	9·8990192		
Eland's Berg................		96·10·38·14		− 0·93	37·21	9·9974713	5·2274032	
Lambert's Hoek Berg.....		31·24· 0·32		− 0·94	59·38	9·7168436	4·9467755	
180+ε.		180· 0· 2·80		− 2·80	0·00		Feet.	
							168811·9	
							88465·8	

△ 111.—Ceder Berg to Kapitein's Kloof = 224249·12 Feet...Log. 5·3507308. (From △ 23.)

NAMES OF STATIONS.	WEIGHT.	ANGLES.	Proportion of Error.	Corrections $-\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	REFERENCES.
Donkin's Bay.............*		42·42·39·47		− 5·04	34·43	9·8314105		
Ceder Berg..................		64·38·57·42		− 5·04	52·38	9·9560212	5·4753415	
Kapitein's Kloof...........		72·38·38·22		− 5·03	33·19	9·9797587	5·4990790	
180+ε.		180· 0·15·11		−15·11	0·00		Feet.	
							298773·1	
							315557·9	

△ 112.—Bokkeveld Berg to Heerenlogement's Berg = 322890·82 Feet...Log. 5·5090557. (From △ 26.)

NAMES OF STATIONS.	WEIGHT.	ANGLES.	Proportion of Error.	Corrections $-\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	REFERENCES.
Klip Rug, kop.............*		77·59·10·49		− 4·88	5·61	9·9903800		
Bokkeveld Berg............		59·44·11·40		− 4·88	6·52	9·9363654	5·4550411	See △ 114.
Heerenlogement's Berg...		42·16·52·74		− 4·87	47·87	9·8278562	5·3465319	See △ 113.
180+ε.		180· 0·14·63		−14·63	0·00		Feet.	
							285128·8	
							222091·5	

△ 113.—Keibiskow to Bokkeveld Berg = 167709·38 Feet...Log. 5·2245574. (From △ 31.)

NAMES OF STATIONS.	WEIGHT.	ANGLES.	Proportion of Error.	Corrections $-\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	REFERENCES.
Klip Rug, kop.............*		35·30·16·73		− 2·93	13·80	9·7639948		
Keibiskow		50·16·10·05		− 2·93	7·12	9·8859545	5·3465171	See △ 112.
Bokkeveld Berg............		94·13·42·00		− 2·92	39·08	9·9988168	5·4593794	
180+ε.		180· 0· 8·78		− 8·78	0·00		Feet.	
							222083·9	
							287991·3	

△ 114.—Lambert's H. Bg. to Heerenlogement's Bg. = 139459·81 Feet...Log. 5·1444491. (From △ 15.)

NAMES OF STATIONS.	WEIGHT.	ANGLES.	Proportion of Error.	Corrections $-\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	REFERENCES.
Klip Rug, kop.............*		26·18· 6·99		− 3·13	3·86	9·6464900		
Lambert's Hoek Berg....		64·56·31·40		− 3·13	28·27	9·9570676	5·4550267	See △ 112.
Heerenlogement's Berg...		88·45·31·00		− 3·13	27·87	9·9998979	5·4978570	
180+ε.		180· 0· 9·39		− 9·39	0·00		Feet.	
							285119·3	
							314671·2	

§ 6.

NAMES OF STATIONS.	WEIGHT.	ANGLES.	Proportion of Error.	Corrections $-\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	REFERENCES.
△ 115.—Bokkeveld Berg to Klip Rug = 219005·20 Feet... Log. 5·3404544. (From △ 26.)								
Groote Toren B., Hantam*		° ′ ″ 66·45·26·50	″	″ − 2·36	″ 24·14	9·9632386		
Bokkeveld Berg............		36· 5· 9·68		− 2·36	7·32	9·7701079	5·1473237	
Klip Rug....................		77· 9·30·90		− 2·36	28·54	9·9889986	5·3662144	
180+ε.		180· 0· 7·08		− 7·08	0·00		Feet. 140386·0 232388·4	
△ 116.—Klip Rug to Bokkeveld Berg = 219005·20 Feet... Log. 5·3404544. (From △ 26.)								
Spion Berg, kop...........*		49·49·38· 1		− 4·1	34·0	9·8831446		
Klip Rug.....................		64· 8·48· 1		− 4·1	44·0	9·9541966	5·4115064	
Bokkeveld Berg............		66· 1·46· 0		− 4·0	42·0	9·9608257	5·4181355	
180+ε.		180· 0·12· 2		− 12·2	0·0		Feet. 257932·7 261900·0	

SECTION VII.

DETERMINATION

OF THE

MERIDIONAL DISTANCES OF THE SECTOR STATIONS.

§ 7.

At the Royal Observatory, the azimuth of the Meridian Mark from the south point round by the west	° ′ ″ 179·59·57·000
Angle, Meridian Mark, Observatory, Sneeuwkop	103·38·51·417
„ Kapoc Berg, Observatory, Sneeuwkop	111· 3· 2·598
„ Kapoc Berg, Observatory, Riebeek's Kasteel	34·30· 6·675
„ Sneeuwkop, Observatory, Zwart Kop	79·54·10·486
Azimuth of Sneeuwkop	283·38·48·417
„ Kapoc Berg	172·35·45·819
„ Riebeek's Kasteel	207· 5·52·494
„ Zwart Kop	3·32·58·903

I. Royal Observatory, Heerenlogement's Berg, Kamies Sector Berg, North End.

No. 1.—Riebeek's Kasteel to Royal Observatory = 239295·22 Feet. . . Log. 5·3789340. (△ 46, p. 543.)

STATIONS AND NODES.	NOS. OF THE ANGLES.	SPHERICAL ANGLES.	$\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	DISTANCES IN FEET.
n_{11}		° ′ ″ 20·11·64·28	″ — 4·37	″ 59·91	9·5381937	5·3789340	
Royal Observatory........		27· 5·52·49	4·37	48·12	9·6584823	5·4992226	315662·12
Riebeek's Kasteel..........	28+31	132·42·16·34	4·37	11·97	9·8662137	5·7069540	+509276·82
180+ε.		180· 0·13·11	—13·11	0·00			

No. 2.—Piket Berg to n_{11} (315662·12—253359·59) = 62302·53 Feet. (△ 9, p. 535.)

STATIONS AND NODES.	NOS. OF THE ANGLES.	SPHERICAL ANGLES.	$\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	DISTANCES IN FEET.
n_7		56·54·36·03	— 0·12	35·91	9·9231475	4·7945057	
n_{11}		20·12· 4·28	0·12	4·16	9·5382181	4·4095763	25678·89
Piket Berg.................	(43+44+46+47+48)	102·53·20 06	0·13	19·93	9·9889175	4·8602757	—72489·60
180+ε.		180· 0· 0·37	— 0·37	0·00			

No. 3.—Ceder Berg to n_7 (226171·64+25678·89) = 251850·53 Feet. (△'s 18 & 19, p. 537.)

STATIONS AND NODES.	NOS. OF THE ANGLES.	SPHERICAL ANGLES.	$\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	DISTANCES IN FEET.
n_{15}		52· 7·52·69	— 5·01	47·68	9·8972997	5·4011429	
n_7		56·54·36·03	5·01	31·02	9·9231408	5·4269840	267290·80
Ceder Berg.................	62	70·57·46·31	5·01	41·30	9·9755694	5·4794126	+301587·01
180+ε.		180· 0·15·03	—15·03	0·00			

No. 4.—Heerenlogement's Berg to n_{15} (267290·80—228991·32) = 38299·48 Feet. (△ 19, p. 537.)

STATIONS AND NODES.	NOS. OF THE ANGLES.	SPHERICAL ANGLES.	$\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	DISTANCES IN FEET.
p_1		89·59·60·00	— 0·05	59·95	0·0000000	4·5831929	
n_{15}		52· 7·52·69	0·06	52·63	9·8973078	4·4805007	30234·35
Heerenlogement's Berg...		37·52· 7·48	0·06	7·42	9·7880654	4·3712583	23510·31
180+ε.		180· 0· 0·17	— 0·17	0·00			

No. 5.—Heerenlogement's Berg to n_{15} (267290·80—228991·32) = 38299·48 Feet. (△ 19, p. 537.)

STATIONS AND NODES.	NOS. OF THE ANGLES.	SPHERICAL ANGLES.	$\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	DISTANCES IN FEET.
n_{13}		21·55·21·83	— 0 23	21·60	9 5721217	4·5831929	
n_{15}		52· 7·52 69	0·23	52·46	9·8973075	4 9083787	80980·17
Heerenlogement's Berg..		105·56·46·18	0·24	45·94	9·9829586	4 9940298	—98634·73
180+ε.		180· 0· 0·70	— 0·70	0·00			

STATIONS AND NODES.	NOS. OF THE ANGLES.	SPHERICAL ANGLES.	$\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	DISTANCES IN FEET.
No. 6.—Bokkeveld Berg to n_{13} (322890·82+80980·17) = 403870·99 Feet. (△ 26, p. 539.)							
n_{19}		41°51′47″·95	−6″·45	41″·50	9·8243424	5·6062427	
n_{13}		21·55·21·83	6·45	15·38	9·5720892	5·3539895	225938·13
Bokkeveld Berg............	70+72	116·13· 9·56	6·44	3·12	9·9528521	5 7347524	+542940·75
180+ε.		180· 0·19·34	−19·34	0·00			
No. 7.—Kamies-Sector Berg to n_{19} (385649·91−225938·13) = 159711·78 Feet. (△ 28, p. 539.)							
p_2		89·59·60·00	−1·00	59·00	0·0000000	5·2033369	
n_{19}		41·51·47·95	1·00	46·95	9·8243552	5·0276921	106584·02
Kamies-Sector Berg......		48· 8·15·05	1·00	14·05	9·8720078	5·0753447	118944·60
180+ε.		180· 0· 3·00	−3·00	0·00			
No. 8.—Kamies-Sector Berg to n_{19} (385649·91−225938·13) = 159711·78 Feet. (△ 28, p. 539.)							
n_{22}		30 39·43·14	−2·51	40·63	9·7075377	5.2033369	
n_{19}		41·51·47·95	2·51	45·44	9·8243516	5·3201508	209002·16
Kamies-Sector Berg......	93+94+95+99−98	107·28·36·44	2·51	33·93	9·9794766	5·4752758	+298727·92
180+ε.		180· 0· 7·53	−7·53	0·00			
No. 9.—North End to n_{22} (261277·19−209002·16) = 52275·03 Feet. (△ 39, p. 541.)							
p_3		89·59·60·00	−0·10	59·90	0·0000000	4·7182942	
n_{22}		30·39·43·14	0·09	43·05	9.7075463	4·4258405	26658·79
North End..................		59·20·17·14	0·09	17·05	9·9345951	4·6528893	44966·52
180+ε.		180· 0· 0·28	−0·28	0·00			

Distances between the Perpendiculars from the Stations:

No. 1.	Royal Observatory	to n_{11}	... ...	+ 509276·82 feet
„ 2.	n_7	„ n_{11}	... ...	− 72489·60 „
„ 3.	n_7	„ n_{15}	... ...	+ 301587·01 „
„ 4.	n_{15}	„ p_1	... ...	− 23510·31 „
	Royal Observatory to Heerenlogement's Berg		... ...	714863·92
No. 6.	n_{13}	to n_{19}	... ...	+ 542940·75 feet
„ 5.	n_{13}	„ n_{15}	... ...	− 98634·73 „
„ 4.	n_{15}	„ p_1	... ...	+ 23510·31 „
„ 7.	n_{19}	„ p_2	... ...	+ 118944·60 „
	Heerenlogement's Berg to Kamies-Sector Berg		... ...	586760·93
No. 8.	n_{19}	to n_{22}	... ...	+ 298727·92 feet
„ 7.	n_{19}	„ p_2	... ...	− 118944·60 „
„ 9.	n_{22}	„ p_3	... ...	+ 44966·52 „
	Kamies-Sector Berg to North End ...		... ...	224749·84

§ 7.

II. Royal Observatory, Heerenlogement's Berg, Kamies-Sector Berg, North End.

STATIONS AND NODES.	NOS. OF THE ANGLES.	SPHERICAL ANGLES.	$\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	DISTANCES IN FEET.
No. 10.—Riebeek's Kasteel to Royal Observatory = 239295·22 Feet. . Log. 5·3789340. (△ 46, p. 543.)							
n_2		° ′ ″ 100·44·35·52	− ″1·65	″33·87	9·9923211	5·3789340	
Royal Observatory.	31	27· 5·52·49	1·65	50·84	9·6584935	5·0451064	110944·71
Riebeek's Kasteel..........		52· 9·36·94	1·65	35·29	9·8974758	5·2840887	+192348·45
180+ε.		180· 0· 4·95	− 4·95	0·00			
No. 11.—Kapoc Berg to n_2 (135773·25—110944·71) = 24828·54 Feet. (△ 2, p. 534.)							
n_4		32·58·54·21	− 0·06	54·15	9·7358952	4·3949512	
n_2	22	100·44·35·52	0·06	35·46	9·9923204	4·6513764	44810·15
Kapoc Berg..................		46·16·30·46	0·07	30·39	9·8589382	4·5179942	+32960·53
180+ε.		180· 0· 0·19	− 0·19	0·00			
No. 12.—Zwart Berg to n_4 (157967·09—44810·15) = 113156·94 Feet. (△ 7, p. 535.)							
n_5		68·12· 3·98	− 0·58	3.40	9·9677781	5·0536812	
n_4	34	32·58·54·21	0·58	53·63	9·7358935	4·8217966	66343·23
Zwart Berg.................		78·49· 3·55	0·58	2·97	9·9916754	5·0775785	+119557·96
180+ε.		180· 0· 1·74	− 1·74	0·00			
No. 13.—Patrys Berg to n_5 (208827·67—66343·23) = 142484·44 Feet. (△'s 10 & 11, pp. 535, 536.)							
n_8		70·58·41·10	− 1·03	40·07	9·9756121	5·1537674	
n_5	40	68·12· 3·98	1·03	2·95	9·9677778	5·1459331	139937·17
Patrys Berg................		40·49·18·00	1·02	16·98	9·8153805	4.9935358	+ 98522·59
180+ε.		180· 0· 3·08	− 3·08	0·00			
No. 14.—Piket Berg to n_8 (162693·99—139937·17) = 22756·82 Feet. (△'s 11 & 12, p. 536.)							
n_{10}		25· 3·44·28	− 0·09	44·19	9·6269592	4·3571116	
n_8	44	70·58·41·10	0·09	41·01	9·9756128	4·7057652	50788·48
Piket Berg..................		83·57·34·89	0·09	34·80	9·9975821	4·7277345	+53423·77
180+ε.		180· 0· 0·27	− 0·27	0·00			
No. 15.—Eland's Berg to n_{10} (147057·91—50788·48) = 96269·43 Feet. (△ 13, p. 536.)							
n_{12}		92·12·45·03	− 0·28	44.75	9·9996761	4·9834884	
n_{10}	54	25· 3·44·28	0·28	44.00	9·6269583	4·6107706	40810·38
Eland's Berg................		62·43·31·52	0·27	31·25	9·9488139	4·9326262	+85630·06
180+ε.		180· 0· 0·83	− 0·83	0·00			

§ 7.

STATIONS AND NODES.	NOS. OF THE ANGLES.	SPHERICAL ANGLES.	$\frac{1}{3}\varepsilon$.	Seconds Reduced Angles.	LOG SINES.	LOG DISTANCES.	DISTANCES IN FEET.
No. 16.—Eland's Berg to n_{12} = 40810·38 Feet... Log. 4·6107706. (No. 15, p. 562.)							
n_{14}		° ′ ″ 28·29·25·23	″ − 0·25	″ 24·98	9·6785270	4·6107706	
n_{12}		87·47·14·97	0·25	14·72	9·9996761	4·9319197	85490 86
Eland's Berg................	56	63·43·20·54	0·24	20·30	9·9526272	4·8848708	+76713·32
180+ε.		180· 0· 0·74	− 0·74	0·00			
No. 17.—Heerenl.'s Berg to n_{14} (148873·79—85490·86) = 63382·93 Feet. (△'s 15 & 16, pp. 536, 537.)							
p_1		89·59·60·00	− 0·14	59·86	0·0000000	4·8019723	
n_{14}		28·29·25·23	0·13	25·10	9·6785275	4·4804998	30234·29
Heerenlogement's Berg...		61·30·35·17	0·13	35·04	9·9439385	4·7459108	+55707·13
180+ε.		180· 0· 0·40	− 0·40	0·00			
No. 18.—Heerenl.'s Berg to n_{14} (148873·79—85490·86) = 63382·93 Feet. (△'s 15 & 16, pp. 536, 537.)							
n_{16}		27·55·37·75	− 0·27	37·48	9·6705681	4·8019723	
n_{14}		28·29·25·23	0·27	24·96	9·6785270	4·8099312	64555·19
Heerenlogement's Berg...		123·34·57·83	0·27	57·56	9·9206912	5·0520954	+112744·51
180+ε.		180· 0· 0·81	− 0·81	0·00			
No. 19.—Lewis Fontein to n_{16} (387566·90—64555·19) = 323011·71 Feet. (△ 27, p. 539.)							
n_{18}		98· 4·52·51	− 3·14	49·37	9·9956667	5·5092183	
n_{16}		27·55·37·75	3·14	34·61	9·6705567	5·1841083	152794·70
Lewis Fontein	76	53·59·39·17	3·15	36·02	9·9079209	5·4214725	+263920·12
180+ε.		180· 0· 9·43	− 9·43	0·00			
No. 20.—Bokkeveld Berg to n_{18} (305086·50—152794·70) = 152291·80 Feet. (△ 27, p. 539.)							
n_{19}		41·51·47·95	− 1·74	46·21	9·8243534	5·1826765	
n_{18}		98· 4·52·51	1·75	50·76	9·9956663	5·3539894	225938·07
Bokkeveld Berg............	72	40· 3·24·77	1·74	23·03	9·8085765	5·1668996	+146858·68
180+ε.		180· 0· 5·23	− 5·23	0·00			
No. 21.—Kamies-Sector Berg to n_{19} (385649·91—225938·07) = 159711·84 Feet. (△ 28, p. 539.)							
p_2		89·59·60·00	− 1·00	59·00	0·0000000	5·2033371	
n_{19}		41·51·47·95	1·00	46·95	9·8243552	5·0276923	106584·07
Kamies-Sector Berg......		48· 8·15·05	1·00	14·05	9·8720078	5·0753449	118944·65
180+ε.		180· 0· 3·00	− 3·00	0·00			
No. 22.—Kamies-Sector Berg to n_{19} (385649·91—225938·07) = 159711·84 Feet. (△ 28, p. 539.)							
n_{21}		63·48·30·61	− 1·44	29·17	9·9529478	5·2033371	
n_{19}		41·51·47·95	1·44	46·51	9·8243541	5·0747434	118780·03
Kamies-Sector Berg......	93+95	74·19·45·76	1·44	44·32	9·9835489	5·2339382	+171371·34
180+ε.		180· 0· 4·32	− 4·32	0·00			

§ 7.

STATIONS AND NODES.	NOS. OF THE ANGLES.	SPHERICAL ANGLES.	$\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	DISTANCES IN FEET.
No. 23.—Boschluis to n_{21} (299714·62—118780·03) = 180934·59 Feet. (△ 32, p. 540.)							
n_{24}		° ′ ″ 59·30·46·22	″ − 2·24	″ 43·98	9·9353749	5·2575216	
n_{21}		63·48·30·61	2·24	28·37	9·9529469	5·2750936	188405·52
Boschluis	105	56·40·49·90	2·25	47·65	9·9220061	5·2441528	+175449·76
180+ε.		180· 0· 6·73	− 6·73	0·00			
No. 24.—Koeberg to n_{24} (188405·52—186718·75) = 1686·77 Feet. (△ 33, p. 540.)							
n_{23}		95· 8·53·78	− 0·00	53·78	9·9982445	3·2270559	1459·45
n_{24}		59·30·46·22	0·00	46·22	9·9353777	3·1641891	− 724·81
Koeberg	102—100—101	25·20·20·00	0·00	20·00	9·6314147	2·8602261	
180+ε.		180· 0· 0·00	− 0·00	0·00			
No. 25.—North-End Sect. Stat. to n_{23} (25307·32+1459·45)=26766·77 Feet. (△ 40&41, pp.541&542.)							
p_3		90· 0· 0·00	− 0·00	0·00	0·0000000	4·4275960	
n_{23}		84·51· 6·22	0·01	6·21	9·9982444	4·4258404	26658·78
North-End Sect. Station		5· 8·53·80	0·01	53·79	8·9529546	3·3805566	− 2401·88
180+ε.		180· 0· 0·02	− 0·02	0·00			

Collecting the results we have:

No. 10.	Royal Observatory	to n_2	... ...	+ 192348·45	feet
„ 11.	n_2	„ n_4	... ...	+ 32960·53	„
„ 12.	n_4	„ n_5	... ...	+ 119557·96	„
„ 13.	n_5	„ n_8	... ...	+ 98522·59	„
„ 14.	n_8	„ n_{10}	... ...	+ 53423·77	„
„ 15.	n_{10}	„ n_{12}	... ...	+ 85630·06	„
„ 16.	n_{12}	„ n_{14}	... ...	+ 76713·32	„
„ 17.	n_{14}	„ p_1	... ...	+ 55707·13	„
	Royal Observatory to perpendicular from Heerenlogement's Berg			= 714863·81	
No. 17.	n_{14}	to p_1	... ...	− 55707·13	feet
„ 18.	n_{14}	„ n_{16}	... ...	+ 112744·51	„
„ 19.	n_{16}	„ n_{18}	... ...	+ 263920·12	„
„ 20.	n_{18}	„ n_{19}	... ...	+ 146858·68	„
„ 21.	n_{19}	„ p_2	... ...	+ 118944·65	„
	Between perpendiculars from Heerenlogemt's B. and Kamies-Sec. B.			= 586760·83	
No. 21.	n_{19}	to p_2	... ...	− 118944·65	feet
„ 22.	n_{19}	„ n_{21}	... ...	+ 171371·34	„
„ 23.	n_{21}	„ n_{24}	... ...	+ 175449·76	„
„ 24.	n_{23}	„ n_{24}	... ...	− 724·81	„
„ 25.	n_{23}	„ p_3	... ...	− 2401·88	„
	Between perpendiculars from Kamies-Sec. B. and North End Sec. St.			= 224749·76	

§ 7.

III. Royal Observatory, Heerenlogement's Berg, Kamies-Sector Berg, North End.

STATIONS AND NODES.	NOS. OF THE ANGLES.	SPHERICAL ANGLES.	$\frac{1}{3}\varepsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	DISTANCES IN FEET.
No. 26.—Sneeuw Kop to Royal Observatory = 158172·51 Feet. . Log. 5·1991310. (△ 52, p. 544.)							
n_1		38°·21′·34″·31	− 1″·90	32″·41	9·7928026	5·1991310	
Royal Observatory.......		103·38·48·42	1·90	46·52	9·9875638	5·3938922	247680·74
Sneeuwkop....................	138	37·59·42·97	1·90	41·07	9·7892910	5·1956194	+156898·73
180+ε.		180· 0· 5·70	− 5·70	0·00			
No. 27.—Kapoc Berg to n_1 (286987·28—247680·74) = 39306·54 Feet. (△'s 52, 53, 54, p. 544.)							
n_3		63·44·29·05	− 0·08	28·97	9·9526986	4·5944648	
n_1		38·21·34·31	0·08	34·23	9·7928074	4·4345736	27200·29
Kapoc Berg..................	21	77·53·56·89	0·09	56·80	9·9902411	4·6320073	+42855·57
180+ε.		180· 0· 0·25	− 0·25	0·00			
No. 28.—Winter Berg to n_3 (255508·12—27200·29) = 228307·83 Feet. (△ 22, p. 538.)							
n_9		50·56·19·94	− 4·31	15·63	9·8901196	5·3585208	
n_3		63·44·29·05	4·31	24·74	9·9526942	5·4210954	263691·04
Winter Berg................	142	65·19·23·93	4·30	19·63	9·9584059	5·4268071	+267181·96
180+ε.		180· 0·12·92	−12·92	0·00			
No. 29.—Kapitein's Kloof to n_9 (263691·04—226609·48) = 37081·56 Feet. (△ 22, p. 538.)							
n_6		54·20·39·15	− 0·10	39·05	9·9098412	4·5691580	
n_9		50·56·19·94	0·10	19·84	9·8901268	4·5494436	35435·91
Kapitein's Kloof...........	51	74·43· 1·21	0·10	1·11	9·9843633	4·6436801	−44023·05
180+ε.		180· 0· 0·30	− 0·30	0·00			
No. 30.—Ceder Berg to n_6 (224249·12+35435·91) = 259685·03 Feet. (△ 23, p. 538.)							
n_{15}		52· 7·52·45	− 5·25	47·20	9·8972989	5·4144469	
n_6		54·20·39·15	5·24	33·91	9·9098334	5·4269814	267289·20
Ceder Berg..................	60	73·31·44·13	5·24	38·89	9·9817986	5·4989466	+315461·67
180+ε.		180· 0·15·73	−15·73	0·00			
No. 31.—Heerenlogement's Berg to n_{15} (267289·20—228991·32) = 38297·88 Feet. (△ 19, p. 537.)							
p_1		89·59·60·00	− 0·05	59·95	0·0000000	4·5831747	
n_{15}		52· 7·52·45	0·06	52·39	9·8973074	4·4804821	30233·06
Heerenlogement's Berg..		37·52· 7·72	0·06	7·66	9·7880661	4·3712408	−23509·36
180+ε.		180· 0· 0·17	− 0·17	0·00			

§ 7.

STATIONS AND NODES.	NOS. OF THE ANGLES.	SPHERICAL ANGLES.	$\frac{1}{3}\epsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	DISTANCES IN FEET.
No. 32.—Heerenlogement's Berg to n_{15} (267289·20—228991·32) = 38297·88 Feet. (△ 19, p. 537.)							
n_{13}		21° 55′ 22″·07	— 0″·23	21″·84	9·5721230	4·5831747	
n_{15}		52 7 52·45	0·23	52·22	9·8973072	4·9083589	80976·48
Heerenlogement's Berg..		105 56 46·18	0·24	45·94	9·9829586	4·9940103	—98630·30
180+ε.		180 0 0·70	— 0·70	0·00			
No. 33.—Bokkeveld Berg to n_{13} (322890·82+80976·48) = 403867·30 Feet. (△ 26, p. 539.)							
n_{19}		41 51 47·71	— 6·45	41·26	9·8243418	5·6062387	
n_{13}		21 55 22·07	6·45	15·62	9·5720905	5·3539874	225937·03
Bokkeveld Berg............	70+72	116 13 9·56	6·44	3·12	9·9528521	5·7347490	+542936·50
180+ε.		180 0 19·34	—19·34	0·00			
No. 34.—Kamies-Sector Berg to n_{19} (385649·91—225937·03) = 159712·88 Feet. (△ 28, p. 539.)							
p_2		89 59 60·00	— 1·00	59·00	0·0000000	5·2033399	
n_{19}		41 51 47·71	1·00	46·71	9·8243546	5·0276945	106584·61
Kamies-Sector Berg......		48 8 15·29	1·00	14·29	9·8720082	5·0753481	118945·54
180+ε.		180 0 3·00	— 3·00	0·00			
No. 35.—Kamies-Sector Berg to n_{19} (385649·91—225937·03) = 159712·88 Feet. (△ 28, p. 539.)							
n_{22}		30 39 43·38	— 2·51	40·87	9·7075385	5·2033399	
n_{19}		41 51 47·71	2·51	45·20	9·8243511	5·3201525	209002·98
Kamies-Sector Berg......	93+94+95+99—98	107 28 36·44	2·51	33·93	9·9794766	5·4752780	+298729·45
180+ε.		180 0 7·53	— 7·53	0·00			
No. 36.—North End Sector Station to n_{22} (261277·19—209002·98) = 52274·21 Feet. (△ 39, p. 541.)							
p_3		89 59 60·00	— 0·10	59·90	0·0000000	4·7182874	
n_{22}		30 39 43·38	0·09	43·29	9·7075471	4·4258345	26658·42
North End Sector Station		59 20 16·90	0·09	16·81	9·9345948	4·6528822	+44965·78
180+ε.		180 0 0·28	— 0·28	0·00			

Collecting the results, we have:

No. 26.	Royal Observatory	to n_1	... ...	+ 156898·73 feet
„ 27.	n_1	„ n_3	... ...	+ 42855·57 „
„ 28.	n_3	„ n_9	... ...	+ 267181·96 „
„ 29.	n_6	„ n_9	... ...	— 44023·05 „
„ 30.	n_6	„ n_{15}	... ...	+ 315461·67 „
„ 31.	n_{15}	„ p_1	... ...	— 23509·36 „
	Royal Observatory to perpendicular from Heerenlogement's Berg			= 714865·52
„ 31.	n_{15}	„ p_1	... ...	+ 23509·36 feet
„ 32.	n_{13}	„ n_{15}	... ...	— 98630·30 „
„ 33.	n_{13}	„ n_{19}	... ...	+ 542936·50 „
„ 34.	n_{19}	„ p_2	... ...	+ 118945·54 „
	Distance between perpendiculars from Kamies-Sector Berg and North-End Sector Station			= 586761·10
„ 34.	n_{19}	„ p_2	... ...	— 118945·54 feet
„ 35.	n_{19}	„ n_{22}	... ...	+ 298729·45 „
„ 36.	n_{22}	„ p_3	... ...	+ 44965·78 „
	Distance between perpendiculars from Heerenlogement's Berg and Kamies-Sector Berg			= 224749·69

§ 7.

IV. Heerenlogement's Berg, Kamies-Sector Berg, North End.

STATIONS AND NODES.	NOS. OF THE ANGLES.	SPHERICAL ANGLES.	$\frac{1}{3}\epsilon$.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	DISTANCES IN FEET.
No. 37.—Bokkeveld Berg to n_{13} (322890·82+80976·48) = 403867·30 Feet. (From No. 33, p. 566.)							
n_{17}		132° 2′ 39″·83	− 2″·84	36″·99	9·8707756	5·6062387	
n_{13}		21·55·22·07	2·83	19·24	9·5721094	5·3075725	203035·75
Bokkeveld Berg............	70+72+73 (−180°)	26· 2· 6·60	2·83	3·77	9·6423759	5·3778390	+238692·64
180+ε.		180· 0· 8·50	− 8·50	0·00			
No. 38.—Keibiscoe to n_{17} (167709·38+203035·75) = 370745·13 Feet. (△ 31, p. 540.)							
n_{20}		65·23·47·82	− 8·12	39·70	9·9586571	5·5690755	
n_{17}		47·57·20·17	8·12	12·05	9·8707548	5·4811732	302812·08
Keibiscoe.....................	80	66·39·16·37	8·12	8·25	9·9628979	5·5733163	+374383·19
180+ε.		180· 0·24·36	−24·36	0·00			
No. 39.—Kamies Berg Sec. Stat. to n_{20} (420039·71—302812·08) = 117227·63 Feet. (△ 31, p. 540.)							
p_2		89·59·60·00	− 0·41	59·59	0·0000000	5·0690300	
n_{20}		65·23·47·82	0·41	47·41	9·9586645	5·0276945	106584·61
Kamies-Sector Berg......		24·36·13·41	0·41	13·00	9·6194462	4·6884762	48806·34
180+ε.		180· 0· 1·23	− 1·23	0·00			
No. 40.—Kamies-Sector Berg to n_{20} (420039·71—302812·08) = 117227·63 Feet. (△ 31, p. 540.)							
n_{25}		25·27· 0·47	− 2·29	58·18	9·6331808	5·0690300	
n_{20}		65·23·47·82	2·29	45·53	9·9586627	5·3945119	248034·40
Kamies-Sector Berg......	93+94	89· 9·18·58	2·29	16·29	9·9999527	5·4358019	+272773·33
180+ε.		180· 0· 6·87	− 6·87	0·00			
No. 41.—Koe Berg to n_{25} (251416·13—248034·40) = 3381·73 Feet. (△ 33, p. 540.)							
n_{23}		84·51· 5·97	− 0·00	5·97	9·9982444	3·5291389	
n_{25}		25·27· 0·47	0·00	0·47	9·6331910	3·1640855	1459·10
Koeberg	(180°)+101−102	69·41·53·56	0·00	53·56	9·9721464	3·5030409	+3184·49
180+ε.		180· 0· 0·00	− 0·00	0·00			
No. 42.—North-End Sect. Stat. to n_{23} (25307·32+1459·10)=26766·42 Feet. (△40&41, pp.541&542.)							
p_3		90· 0· 0·00	− 0·00	0·00	0·0000000	4·4275903	
n_{23}		84·51· 5·97	0·01	5·96	9·9982444	4·4258347	26658·44
North End Sector Station		5· 8·54·05	0·01	54·04	8·9529604	3·3805507	−2401·88
180+ε.		180· 0· 0·02	− 0·02	0·00			

§ 7.

Collecting the results, we have:

No. 31.	n_{15}	„ p_1	... ...	+ 23509·36 feet
„ 32.	n_{13}	„ n_{15}	... ...	− 98630·30 „
„ 37.	n_{13}	„ n_{17}	... ...	+ 238692·64 „
„ 38.	n_{17}	„ n_{20}	... ...	+ 374383·19 „
„ 39.	n_{20}	„ p_2	... ...	+ 48806·34 „

Between perpendiculars from Heerenlogement's Berg and Kamies-Sector Berg = 586761·23

„ 39.	n_{20}	„ p_2	... ...	− 48806·34 feet
„ 40.	n_{20}	„ n_{25}	... ...	+ 272773·33 „
„ 41.	n_{23}	„ n_{25}	... ...	+ 3184·49 „
„ 42.	n_{23}	„ p_3	... ...	− 2401·88 „

Between perpendiculars from Kamies-Sector Berg and North-End Sector Station = 224749·60

V. Royal Observatory, Zwart Kop.

STATIONS AND NODES.	NOS. OF THE ANGLES.	SPHERICAL ANGLES.	⅓ ε.	Seconds of Reduced Angles.	LOG SINES.	LOG DISTANCES.	DISTANCES IN FEET.
No. 43.—Zwart Kop to Royal Observatory = 106401·13 Feet..Log. 5·0269462. (△ 55, p. 544.)							
p_4		89°59′60″·00	− 0″·06	59″·94	0·0000000	5·0269462	
Royal Observatory.......		3·32·58·90	0·06	58·84	8·7917885	3·8187347	6587·71
Zwart Kop.................		86·27· 1·27	0·05	1·22	9·9991660	5·0261122	106196·99
180+ε.		180· 0· 0·17	− 0·17	0·00			
No. 44.—Royal Observatory to Simon's Berg = 133099·24 Feet..Log. 5·1241756. (△ 47, p. 543.)							
n_{26}		46·12·57·71	− 1·03	56·68	9·8585074	5·1241756	
Royal Observatory........		100·58·46·39	1·02	45·37	9·9919771	5·2576453	180986·12
Simon's Berg...............	125	32·48·18·98	1·03	17·95	9·7338240	4·9994922	99883·14
180+ε.		180· 0· 3·08	− 3·08	0·00			
No. 45.—Zwart Kop to n_{26} (190110·86−180986·12) = 9124·74 Feet. (△'s 57 and 58, p. 545.)							
p_4		89·50·60·00	− 0·01	59·99	0·0000000	3·9602205	
n_{26}		46·12·57·71	0·00	57·71	9·8585094	3·8187299	6587·64
Zwart Kop...		43·47· 2·30	0·00	2·30	9·8400693	3·8002898	6313·79
180+ε.		180· 0· 0·01	− 0·01	0·00			

No. 44. Royal Observatory to n_{26}			... ...	+ 99883·14 feet
„ 45.	n_{26}	„ p_4	... ...	+ 6313·79 „

Distance Royal Observatory to perpendicular from Zwart Kop = 106196·93
By No. 43 106196·99

Mean....... 106196·96

§ 7.

VI. Royal Observatory, Cape Point.—Calculation of the distance Observatory, Cape Point.

STATIONS AND NODES.	NOS. OF THE ANGLES.	SPHERICAL ANGLES.	$\frac{1}{3}\varepsilon$.	Seconds Reduced Angles.	LOG SINES.	LOG DISTANCES.	DISTANCES IN FEET.
No. 46.—Royal Observatory to Sneeuwkop = 158172·51 Feet..Log. 5·1991310. (△ 52, p. 544.)							
Cape Point		53° 57′ 46″·983	−1″·829	45″·154	9·9077512	5·1991310	
Royal Observatory		75· 1·50·135	1·829	48·306	9·9850048	5·2763846	188966·39[a]
Sneeuwkop	135—139	51· 0·28·368	1·828	26·540	9·8905478	5·1819276	152029·41
180+ε.		180· 0 ·5·486	−5·486	0·000			
No. 47.—Royal Observatory to Simon's Berg = 133099·24 Feet..Log. 5·1241756. (△ 47, p. 543.)							
Cape Point		36·57·51·035	−1·570	49·465	9·7790981	5·1241756	
Royal Observatory		99·39·24·855	1·570	23·285	9·9938026	5·3388801	218212·75[b]
Simon's Berg	119—124+125	43·22·48·820	1·570	47·250	9·8368501	5·1819276	152029·41
180+ε.		180· 0·4·710	−4·710	0·000			

From No. 47.—Angle Cape Point, Royal Observatory, Simon's Berg ... ... 99·39·24·855
„ Simon's Berg, Royal Observatory, Sneeuwkop ... ... 24·37·34·755

∴ „ Sneeuwkop, Royal Observatory, Cape Point ... ... 75· 1·50·100
From No. 46.— „ „ „ „ ... ... 75· 1·50·135

Mean ... 75· 1·50·117
Page 560.—Azimuth of Sneeuwkop at Royal Observatory ... ... 283·38·48·417

∴ Azimuth of Cape Point ... ... 358·40·38·534

STATIONS AND NODES.	NOS. OF THE ANGLES.	SPHERICAL ANGLES.	$\frac{1}{3}\varepsilon$.	Seconds Reduced Angles.	LOG SINES.	LOG DISTANCES.	DISTANCES IN FEET.
No. 48.—Royal Observatory to Cape Point = 152029·41 Feet..Log. 5·1819276. (Nos. 46 and 47.)							
p_5		89·59·60·00	− 0·05	59·95	0·0000000	5·1819276	
Royal Observatory		1·19·21·47	0·04	21·43	8·3632737	3·5452013	3509·15
Cape Point		88·40·38·66	0·04	38·62	9·9998843	5·1818119	151988·92
180+ε.		180· 0· 0·13	− 0·13	0·00			
No. 49.—Royal Observatory to Sneeuwkop = 158172·52 Feet..Log. 5·1991310. (△ 52, p. 544.)							
n_{27}		52·38·25·66	− 1·87	23·79	9·9002786	5·1991310	
Royal Observatory		76·21·11·58	1·87	9·71	9·9875620	5·2864144	193381·25
Sneeuwkop	135—139	51· 0·28·37	1·87	26·50	9·8905478	5·1894002	154667·90
180+ε.		180· 0· 5·61	− 5·61	0·00			
No. 50.—Cape Point to n_{27} (193381·25—188966·39) = 4414·86 Feet. (△ 60, p. 545.)							
p_5		90· 0· 0·00	− 0·00	0·00	0·0000000	3·6449169	
n_{27}		52·38·25·66	0·00	25·66	9·9002816	3·5451985	3509·12
Cape Point		37·21·34·34	0·00	34·34	9·7830561	3·4279730	2679·00
180+ε.		180· 0· 0·00	− 0·00	0·00			

From No. 49. Royal Observatory to n_{27} ... ... = + 154667·90 feet
„ 50. n_{27} „ n_5 ... ... − 2679·00 „

Distance of perpendiculars from Royal Observatory and Cape Point = 151988·90

(a). △ 60, p. 545 (b). △ 59, p. 545.

§ 7.

Calculation of the Reduction to Parallels.

Heerenlogement's Berg. Latitude = 31°·58′·10″.

From No. 4. y = 30234·35 feet.	Log. y^2............ 8·9609824
,, 31. ,, 30233·06 ,,	,, tan. lat..... 9·7952737
Mean 30233·70	8·7562561
	,, 2 Normal.. 7·6220752
	feet
	Reduction = 13·620 ... 1·1341809

Kamies-Sector Berg. Latitude = 30°·21′·21″.

From No. 7. y = 106584·02 feet.	Log. y^2............ 0·0553868
,, 21. ,, 106584·07 ,,	,, tan. lat..... 9·7676462
,, 34. ,, 106584·61 ,,	
,, 39. ,, 106584·61 ,,	9·8230330
	,, 2 Normal.. 7·6220391
Mean 106584·33	feet
	Reduction = 158·852 ... 2·2009939

North-End Sector Station. Latitude = 29°·44′·17″.

From No. 9. y = 26658·79 feet.	Log. y^2............ 8·8516752
,, 25. ,, 26658·78 ,,	,, tan. lat..... 9·7568418
,, 36. ,, 26658·42 ,,	
,, 42. ,, 26658·44 ,,	8·6085170
	,, 2 Normal.. 7·6220256
Mean 26658·61	feet
	Reduction = 9·694 ... 0·9864914

Zwart Kop. Latitude = 34°·13′·34″.

From No. 43. y = 6587·71 feet.	Log. y^2............ 7·6374650
,, 45. ,, 6587·64 ,,	,, tan. lat..... 9·8326786
Mean 6587·68	7·4701436
	,, 2 Normal.. 7·6221278
	feet
	Reduction = 0·705 ... 9·8480158

Cape Point. Latitude = 34°·21′·7″.

From No. 48. y = 3509·15 feet.	Log. y^2............ 7·0904000
,, 50. ,, 3509·12 ,,	,, tan. lat..... 9·8347277
Mean 3509·135	6·9251277
	,, 2 Normal.. 7·6221305
	feet
	Reduction = 0·201 ... 9·3029972

§ 7.

ABSTRACT of RESULTS for the Meridional Distances of the perpendiculars from the Theodolite Points.

ARC.	REFERENCE.	Distances of the Perpendiculars.	MEANS.
	page.	feet.	feet.
Royal Observatory to Heerenlogement's Berg......	561	714863·92	
	564	714863·81	
	566	714865·52	714864·69
Heerenlogement's Berg to Kamies Sector Berg....	561	586760·93	
	564	586760·83	
	566	586761·10	
	568	586761·23	586761·02
Kamies Sector Berg to North End....................	561	224749·84	
	564	224749·76	
	566	224749·69	
	568	224749·60	224749·72
Royal Observatory to Zwart Kop....................	568	106196·99	
	568	106196·93	106196·96
Royal Observatory to Cape Point....................	569	151988·92	
	569	151988·90	151988·91

From the above we derive the distances of the perpendiculars and parallels of each Theodolite Point from the North-End, as follows:

ARC.	Distances of the Perpendiculars.	Reduction to Parallels.	Distances of the Parallels.
	feet.	ft. ft. ft.	feet.
North End to Kamies Sector Berg....	224749·72	+9·694−158·852=−149·16	224600·56
„ „ Heerenlogement's Berg	811510·74	+9·694− 13·620=− 3·93	811506·81
„ „ Royal Observatory......	1526375·43	+9·694 ....=+ 9·69	1526385·12
„ „ Zwart Kop................	1632572·39	+9 694− 0·705=+ 8·99	1632581·38
„ „ Cape Point................	1678364·34	+9·694− 0·201=+ 9·49	1678373·83

§ 7.

Calculation of the Reduction from the Zenith Sector Point to the West Rock Theodolite Station Point on the Kamies Berg.

At "Point Azimuth." Angle between Meridian Mark and Louis Fontein (pages 468 and 470) ...		$10^\circ 34' 44''{\cdot}96$
By transit instrument observations, error of Meridian Mark, S.W.		1·86
Angle between Louis Fontein and West Rock theodolite point (pages 469 and 470)		53· 5·20·80
Azimuth of the West Rock theodolite point		63·40· 7·62
Distance between "Point Azimuth" and West Rock point = 210 feet (Elevation above the sea 5144 feet,) reduced to the level of the sea 209·948 feet....	(Log.)	2·3221118
Azimuth of West Rock theodolite point 63° 40′ 7″·62.	(Log. sine)	9·9524267
	(Log. cosine)	9·6469520
West Rock theodolite point, west of Point Azimuth ... ... 188·165 feet		2·2745385
Meridian difference, West Rock, south ... ... 93·1245 feet		1·9690638
Sector point $5\frac{1}{2}$ inches south of parallel of "Point Azimuth" ... ... 0·4583 feet.		
Distance on the Meridian between sector point and West Rock point ... 92·6662 feet. ...	(Log.)	1·9669213
Meridional radius of curvature × sine 1″	(ar. co. Log.)	7·9955823
Sector point North of West Rock theodolite point, difference in latitude 0″·917		9·9625036

Calculation of the Reduction from the Zenith Sector Point to the Theodolite Point on Heerenlogement's Berg.

Azimuth of Piketberg on the horizon of the theodolite point		$1^\circ 50' 21''{\cdot}63$
Angle between Piketberg and the sector point (page 463)		137·45·55·43
Azimuth of sector point on the horizon of the theodolite point		139·36·17·06
Subtense of 20 feet bisected by sector point (page 463). 10 feet.	(Log.)	1·0000000
Angle at theodolite point 2°·17′·7″·8 (page 463). 1°·8′·33″·9.	(Log. cotan.)	1·7001138
Distance of sector point from theodolite point 501·319 feet		2·7001138
Depression of sector point below theodolite point 8°·26′·40″.	(Log. cosine)	9·9952660
	(Log. sine)	9·1668750
Horizontal distance 495·884 feet.	(Log.)	2·6953798
Difference of elevation 73·618 feet.	(Log.)	1·8669888
Height above the sea 2384 feet. Horizontal distance reduced to the level of the sea = 495·828 feet ...		2·6953310
Azimuth of sector point on horizon of theodolite point 139°·36′·17″·06.	(Log. sine)	9·8116131
	(Log. cosine.)	9·8817223
Perpendicular distance west 321·325 feet.	(Log.)	2·5069441
Meridian difference, sector north of theodolite point 377·619 feet.	(Log.)	2·5770533
Meridional radius of curvature × sine 1″, arth. co.	(Log.)	7·9954737
Sector point north of theodolite point, difference in lat. = 3″·737	(Log.)	0·5725270

§ 7.

Calculation of the Reduction from the Zenith Sector Point to the Theodolite Point on Zwart Kop.

Pages 435 and 436.—Base of the small triangle 303·396 feet. Elevation above the sea 1939·26 feet.
Base reduced to the level of the sea 303·382 feet.

	OBSERVED ANGLES.		LOG. SINES.	LOG. SIDES.	SIDES IN FEET.
	° ′ ″	″			
Theodolite Point.....	35· 8·43·35	44	9·7601627	2·4819898	(303·382)
Sector Point...........	88·33·49·60	50	9·9998636	2·7216907	526·85
South End of Base...	56·17·25·05	26	9·9200516	2·6418787	438·41
	—2·00				

		° ′ ″
Azimuth of Sneeuwkop on horizon of theodolite point (from general table)		246·45·34·98
Angle No. 146, page 143, corrected		67·32·21·70
Azimuth of King's Battery station point		179·13·13·28
Angle between sector point and King's Battery station point, page 436		112· 0·52·62
Azimuth of sector point on horizon of theodolite point		67·12·20·66
Theodolite point to sector point 438·41 feet.	(Log.)	2·6418787
67°·12′·20″·66	(Log. sine)	9·9646848
	(Log. cosine)	9·5881857
Perpendicular distance of sector, west 404·17 feet		2·6065635
Meridional distance of sector south 169·85 feet		2·2300644
Meridional radius of curvature × sine 1″.	(Ar. co. log.)	7·9953169
Meridional difference of latitude, or reduction = 1″·6803		0·2253813

§ 7.

TABLE containing the logarithms of the radius of Curvature of the Earth in the Meridian, perpendicular to the Meridian, and in a vertical plane inclined 45° to the Meridian,—also the log. $(2\,r^2 \sin. 1'')^{-1}$ for calculating spherical excess.

The axes of the earth employed in these calculations are: a=20923713 feet and b=20853810 feet.

LATITUDE.		RADIUS OF CURVATURE IN THE MERIDIAN.		RADIUS OF CURVATURE PERP. TO MERIDIAN.		RADIUS OF CURVATURE IN AZIMUTH 45°.		FOR COMPUTING SPHERICAL EXCESS.	
°	′	Log. ρ.	Diff.	Log. ν.	Diff.	Log. r.	Diff.	Log. $\frac{1}{2\,r^2 \sin. 1''}$.	Diff.
29	40	7·3187975	109	7·3209939	36	7·3198944	72	0·3736063	144
	50	88084	109	09975	37	199016	73	5919	146
30	0	88193	110	10012	38	199089	74	5773	148
	10	88303	110	10050	37	199163	74	5625	148
	20	88413	111	10087	36	199237	74	5477	148
	30	88524	111	10123	37	199311	74	5329	148
	40	88635	111	10160	37	199385	74	5181	148
	50	88746	111	10197	38	199459	74	5033	149
31	0	88857	112	10235	37	199533	75	4884	149
	10	88969	113	10272	38	199608	75	4735	150
	20	89082	113	10310	37	199683	75	4585	150
	30	89195	113	10347	37	199758	75	4435	150
	40	89308	114	10384	38	199833	76	4285	151
	50	89422	113	10422	38	199909	76	4134	152
32	0	89535	114	10460	38	199985	76	3982	153
	10	89649	115	10498	38	200061	76	3829	152
	20	89764	114	10536	38	200137	76	3677	153
	30	89878	114	10574	39	200213	77	3524	153
	40	89992	116	10613	38	200290	77	3371	154
	50	90108	115	10651	39	200367	77	3217	154
33	0	90223	116	10690	38	200444	77	3063	155
	10	90339	116	10728	39	200521	78	2908	155
	20	90455	117	10767	39	200599	78	2753	156
	30	90572	117	10806	39	200677	78	2597	156
	40	90689	117	10845	39	200755	78	2441	156
	50	90806	117	10884	39	200833	79	2285	157
34	0	90923	117	10923	39	200912	78	2128	157
	10	91040	118	10962	39	200990	79	1971	158
	20	91158	119	11001	40	201069	79	1813	158
	30	91277	118	11041	39	201148	79	1655	158
	40	91395	118	11080	40	201227	79	1497	158
	50	91513		11120		201306		1339	

SECTION VIII.

§ 8.

ABSTRACT OF THE AZIMUTHS, LOG. DISTANCES, LATITUDES, AND LONGITUDES, ALSO A GENERAL TABLE OF THE LATITUDES AND LONGITUDES, AND RADII OF CURVATURE OF EACH POINT.

In the first column (A), is given the name of the Station at which the calculation originates; the second column (B), gives the name of the Station whose required Latitude and Longitude are contained in columns 8 and 9.

Column 3, contains numbers for reference.

„ 4, exhibits the mode of forming the azimuth (α) of the Station (B), as measured on the horizon of the Station (A). The bracketted numbers in this column refer to the angles so particularized in pages 476—484, corrected respectively by the application of the quantities in pages 521 and 532.

„ 5, contains the value of (α) thus obtained, the log. distance of the two stations, and the arc θ.

„ 6, contains the values of $\frac{1}{2}$ $(\alpha'+\zeta-\omega)$ and $\frac{1}{2}$ $(\alpha'+\zeta+\omega)$, also the small correction ζ.

„ 7, contains the Azimuth (α') of the Station (A) as measured on the horizon of the Station (B), also the difference in Longitude and the difference in Latitude. The former being reckoned from the Meridian of the Royal Observatory,—when to the East.

The formulæ employed in these calculations are given at the end of this Section.

§ 8.

CALCULATION OF GEODETICAL LATITUDES AND LONGITUDES OF POINTS IN THE PRINCIPAL TRIANGULATION.

STATION (A).	POINT DETERMINED (B).	No. for Reference.	FORMATION OF AZIMUTH.	α LOG. DISTANCE θ	$\frac{1}{2}(\alpha'+\zeta-\omega)$. $\frac{1}{2}(\alpha'+\zeta+\omega)$. ζ	α' DIFF. IN LONG. DIFF. IN LAT.	LATITUDE.	LONGITUDE.
				° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″
Royal Observatory........	Meridian Mark............	1	Page 560.	179·59·57·000 4·8351478 0·11·13·724	0· 0· 1·491 0· 0· 1·503 ·000	359·59·57·006 0· 0· 0·012 —0·11·16·849	33·44·46·351	0· 0· 0·012
"	Kapoc Berg.....................	2	α from No. 1, +(109)—(112)	172·35·45·819 5·2771471 0·31· 4·153	3·38·23·388 3·43·11·195 —·005	352·38·25·412 0· 4·47·807 —0·30·57·326	33·25· 5·874	0· 4·47·807
"	Riebeek's Kasteel.........	3	α from No. 2, +(110)	207· 5·52·494 5·3789340 0·39·16·505	13·16·17·781 13·37·42·797 —·025	26·54· 0·603 —0·21·25·016 —0·35· 9·493	33·20·53·707	—0·21·25·016
"	Simon's Berg..............	4	α from No. 2, +(111)	259· 1·13·662 5·1241756 0·21·50·720	39·10·29·900 39·36·19·505 —·004	78·46·49·409 —0·25·49·605 —0· 4·13·502	33·51·40·698	—0·25·49·605
"	Sneeuw Kop................	5	α from No. 2, +(112)	283·38·48·417 5·1991310 0·25·57·634	51·25·40·421 51·56· 6·990 +·006	103·21·47·405 —0·30·26·569 0· 6· 5·436	34· 2· 8·636	—0·30·26·569
"	Cape Point....................	6	Page 569.	358·40·38·534 5·1819276 0·24·57·139	89·19·46·591 89·20·28·446 +·001	178·40·15·036 —0· 0·41·855 0·25· 3·606	34·21· 6·806	—0· 0·41·855
"	Zwart Kop..................	7	α from No. 5, +(114)	3·32·58·903 5·0269462 0·17·27·805	88·12·29·336 88·13·47·796 +·001	183·33·42·869 0· 1·18·460 0·17·30·598	34·13·33·798	0· 1·18·460
Sneeuwkop.....................	Royal Observatory........	8	α' from No. 5,	103·21·47·405 5·1991810 0·25·57·625	37·55·22·482 38·25·49·063 —·006	283·38·48·449 0·30·26·581 —0· 6· 5·436	33·56· 3·200	0· 0· 0·012
"	Kapoc Berg..................	9	α from No. 8, +(138)	141·21·30·372 5·4578627 0·47· 6·145	18·51·50·599 19·27· 4·982 —·043	321·41· 4·376 0·35·14·383 —0·37· 2·763	33·25· 5·873	0· 4·47·814
"	Winter Berg................	10	α from No. 9, +(136)	188·18·18·397 5·5339042 0·56· 6·946	4· 1·38·364 4·11·18·956 —·018	8·12·57·338 —0· 9·40·592 —0·55·47·634	33· 6·21·002	—0·40· 7·161
"	Cape Point..................	11	α from No. 8, —(135)+(139)	52·21·19·037 5·5339042 0·31· 0·873	63·26· 6·629 63·55·51·342 +·019	232·38· 2·048 0·29·44·713 0·18·58·171	34·21· 6·807	—0· 0·41·856

§ 8.

Sneeuwkop..................	Zwart Kop..................	12	α from No. 8, −(141)	66·27·46·073 5·2417112 0·28·38·080	56·21·20·000 56·53· 5·028 +·012	246·45·34·984 0·31·45·028 0·11·25·162	34·13·33·798	0· 1·18·459
„	King's Battery.............	13	α from No. 9, −(137)	100·44· 0·090 5·2167396 0·27· 2·077	39·13· 2·249 39·45· 3·500 −·005	281· 1·54·246 0·32· 1·251 −0· 5· 7·680	33·57· 0·976	0· 1·34·682
Simon's Berg...............	Royal Observatory........	14	α′ from No. 4	78·46·49·409 5·1241756 0·21·50·725	50·16·28·349 50·42·17·964 +·004	259· 1·13·691 0·25·49·615 0· 4·13·502	33·56· 3·200	0· 0· 0·011
„	Cape Point	15	α′ from No. 4 +Angle at Page 569.	35·24· 0·589 5·3388801 0·35·48·900	71·58·23·100 72·23·30·849 +·024	215·38. 6·075 0·25· 7·749 0·29·17·107	34·21· 6·805	−0· 0·41·855
„	King's Battery.............	16	α from No. 14, +(124)−(125)	77· 4·50·044 5·1526031 0·23·19·391	51· 6·14·217 51·33·38·488 +·005	257·20· 7·300 0·27·24·271 0· 5·11·278	33·57· 0·976	0· 1·34·667
„	Rogge Bay..................	17	α from No. 14, +(122)−(123)+(120)	81·46·50·452 5·1715375 0·24·21·751	48·43·56·941 49·13· 0·400 +·003	262· 3· 2·662 0·29· 3·459 0· 3·26·518	33·55·16·216	0· 3·13·855
King's Battery.............	Kapoc Berg..................	18	α′ from No. 16, −(127)	175· 9·57·807 5·2883749 0·31·52·973	2·22·30·966 2·25·44·102 −·003	4·48·15·071 0· 3·13·136 −0·31·55·102	33·25· 5·874	0· 4·47·809
Meridian Mark.............	Cape Point..................	19	α′ from No. 1, +(116)−(117)	359· 5·15·318 5·3432732 0·36·10·761	89·32· 5·005 89·32·46·872 +·001	179· 4·51·876 −0· 0·41·867 0·36·20·455	34·21· 6·806	−0· 0·41·855
„	Sneeuw Kop	20	α′ from No. 1, −(117)	304·31·22·660 5·2708242 0·30·37·228	61·51·58·784 61.22·25·365 +·018	124·14·24·131 −0·30·26·581 0·17·22·285	34· 2· 8·636	−0·30·26·569
Kapoc Berg..................	King's Battery.............	21	α′ from No. 2, +(15)−(16)	355·11·44·915 5·2883749 0·31·53·028	87·33·22·332 87·36·35·469 +·003	175· 9·57·798 −0· 3·13·137 0·31·55·102	33·57· 0·976	0· 1·34·673
„	Royal Observatory........	22	α′ from No. 2	352·38·25·412 5·2771471 0·31· 4·205	86·15·29·010 86·20·16·815 +·005	172·35·45·820 −0· 4·47·805 0·30·57·326	33·56· 3·200	0· 0· 0·005
„	Rogge Bay..................	23	α′ from No. 2, +(17)−(16)	357·31·21·667 5·2628133 0·30· 3·681	88·44·27·817 88·46· 1·766 +·002	177·30·29·581 −0· 1·33·949 0·30·10·343	33·55·16·217	0· 3·13·861
„	Patrys Berg.................	24	α′ from No. 2, −(11)−(22)−(16)	152·51·16·283 5·3731885 0·38·45·600	13·18· 5·279 13·39· 8·181 −·025	333· 2·46·524 0·21· 2·902 −0·34·41·004	32·50·24·870	0·25·50·712
„	West End of Base Line.	25	α′ from No. 2, −(16)−(9)−(20)	173· 1· 0·858 4·7369161 0· 8·57·356	3·28·29·029 3·29·47·163 ·000	353· 1·43·808 0· 1·18·134 −0· 8·55·879	33·16· 9·995	0· 6· 5·944

§ 8.

CALCULATION OF GEODETICAL LATITUDES AND LONGITUDES OF POINTS IN THE PRINCIPAL TRIANGULATION—(*continued*).

STATION (A).	POINT DETERMINED (B).	No. for Reference.	FORMATION OF AZIMUTH.	α LOG. DISTANCE θ	$\frac{1}{2}(\alpha'+\zeta-\omega)$. $\frac{1}{2}(\alpha'+\zeta+\omega)$. ζ	α' DIFF. IN LONG. DIFF. IN LAT.	LATITUDE.	LONGITUDE.
				° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″
Kapoc Berg..................	Piket Berg..................	26	α' from No. 2, $-(16)-(13)$	189·56·31·580 5·4266116 0·43·50·014	4·51·18·833 5· 0·18·410 —·013	9 51·37·256 —0· 8·59·577 —0·43·23·115	32·41·42·759	—0· 4·11·767
"	Kapitein's Kloof...........	27	α' from No. 2, $-(19)-(21)-(10)$	191·47·14·602 5·4171706 0·42·53·457	5·45·34·417 5·55·49·248 —·015	11·41·33·680 —0·10·24·831 —0·42·11·556	32·42·54·318	—0· 5·37·021
"	East End of Base Line..	28	α' from No. 2, $-(16)-(9)$	206·38·48·197 4·8794886 0·12·26·165	13·14·14·157 13·20·54·237 —·003	26·35· 8·397 —0· 6·40·080 —0·11·10·224	33·13·55·650	—0· 1·52·270
"	Zwart Berg..................	29	α' from No. 2, $-(16)-(22)$	213· 1·32·510 5·1985666 0·25·55·654	16·17·43·236 16·34·34·822 —·013	32·52·18·071 —0·16·51·586 —0·21·51·589	33· 3·14·285	—0·12· 3·776
"	Winter Berg....	30	α' from No. 2, $-(19)-(21)$	243·47· 7·490 5·4074047 0·41·56·234	31·18·47·189 32· 3·42·162 —·028	63·22·29·379 —0·44·54·973 —0·18·44·873	33· 6·21·001	—0·40· 7·163
"	Riebeek's Kasteel..........	31	α' from No. 2, $-(16)$	259·18· 2·970 5·1328142 0·22·17·090	39·18·42·351 39·44·55·180 —·004	79· 3·37·535 —0·26·12·829 —0· 4·12·167	33·20·53·707	—0·21·25 019
"	Simon's Berg...............	32	α' from No. 2, $+(14)-(16)$	316·21·48·571 5 3512419 0·36·50·998	67·47· 6·633 68·17·44·044 +·028	136· 4·50·649 —0·30·37·411 0·26·43·825	33·51·49·699	—0·25·49·601
"	Sneeuwkop..................	33	α' from No. 2, $-(19)$	321·41. 4·377 5·4578627 0·47· 6·240	70·23· 8·022 70·58·22·397 +·044	141·21·30·375 —0·35·14·375 0·37· 2·763	34· 2· 8·637	—0·30·26·565
Riebeek's Kasteel..........	Royal Observatory........	34	α' from No. 3	26·54· 0·603 5·3789340 0·39·16·579	76 16·21 242 76·37·46·268 +·025	207· 5·52·515 0·21·25·026 0·35· 9·493	33·56· 3·200	0· 0· 0·006
"	King's Battery.............	35	α' from No. 3, $+(31)-(30)$	27·55·30·128 5·3947445 0·40·43·951	75·44·22 855 76· 7·22·545 +·028	208· 8·14·628 0·22·59.690 0·36· 7·269	33·57· 0·976	0· 1·34·670
"	Rogge Bay..................	36	α' from No. 3, $+(31)-(32)$	30·50·25·467 5·3857613 0·39·53·918	74·15·38·262 74·40·17·143 +·029	211· 4· 4·624 0·24·38·881 0·34·22·510	33·55 16·217	0· 3·13·861

§ 8.

Riebeek's Kasteel.........	East End of Base Line..	37	α′ from No. 3, +(31)+(27)	112·54·36·220 5·0339829 0·17·44·954	33·17·33·666 33·37· 6·422 —·005	298· 5·19·907 0·19·32·756 —0· 6·58·056	33·13·55·651	—0· 1·52·264
"	Zwart Berg..........	38	α from No. 37 +(29)	155·57· 2·477 5·0689720 0·19·14·303	11·54·14·475 12· 3·35·719 —·006	336· 2· 9·800 0· 9·21·244 —0·17·39·421	33· 3·14·286	—0·12· 3·776
"	Piket Berg..................	39	α′ from No. 3, +(31)+(28)	159·36·16·947 5·4037374 0·41·35·085	9·58·33·344 10·15·46·597 —·023	339·45·40·036 0·17·13·253 —0·39·10·948	32·41·42·759	—0· 4·11·767
West End of Base Line..	Klip Fontein, Contra Berg	40	α′ from No. 25, —(1)+(2)	329· 5· 8·260 4·7780188 0· 9·50·702	74·27·52·450 74·33·55·996 +·002	149· 1·48·444 —0· 6· 3·546 0· 8·29·011	33·24·39·006	0· 0· 2·398
"	East End of Base Line...	41	α′ from No. 25, —(1)	251·32·55·388 4·6316371 0· 7· 1·684	35·40·17·485 35·48·15·700 ·000	71·28·33·185 —0. 7·58·215 —0· 2·14·345	33·13·55·650	—0· 1·52·271
East End of Base Line..	Klip Fontein, Contra Berg	42	α′ from No. 28, +(3)—(6)	8·30· 3·282 4·8178781 0·10·47·484	85·43·29·524 85·45·24·188 +·002	188·31· 6·290 0· 1·54·664 0·10·43·355	33·24·39·005	0· 0· 2·394
"	Drie Fontein................	43	α from No. 42, —(4)	305·22·41·806 4·8906091 0·12·45·526	62·31·42·177 62·44· 9·433 +·003	125·15·51·607 —0·12·27·256 0· 7·24·673	33·21·20·323	—0·14·19·526
Zwart Berg..................	Patrys Berg.................	44	α′ from No. 29, +(34)	111·41·21·624 5·3197881 0·34·16·568	33·40· 3·420 34·17·57·902 —·017	292· 1·58·661 0·37·54·482 —0·12·49·416	32·50·24·870	0·25·50·706
"	Piket Berg	45	α from No. 44, +(36)	162·49·30·038 5·1354200 0·22·25·163	8·29·10·873 8·37· 2·881 —·006	342·53·46·240 0· 7·52·008 —0·21·31·527	32·41·42·759	—0· 4·11·768
"	Drie Fontein................	46	α′ from No. 29, +(38)—(37)—(35)	354· 0·41·267 5·0428391 0·18· 6·911	86·58·35·583 87· 0·51·341 +·001	173·59·26·923 —0· 2·15·758 0·18· 6·032	33·21·20·318	—0·14·19·534
Patrys Berg................	Eland's Berg...............	47	α′ from No. 24, —(39)—(40)—(41)	206·24· 5·310 5·3170354 0·34· 3·597	12·58·15·355 13·16·10·770 —·019	26·14·26·144 —0·17·55·415 —0·30·40·487	32·19·44·383	0· 7·55·295
"	Piket Berg..................	48	α from No. 47, +(39)	251·12·40·660 5·2113716 0·26·42·254	35·13·11·294 35·43·13·777 —·009	70·56 25·080 —0·30· 2·483 —0· 8·42·111	32·41·42·759	—0· 4·11·773
"	Kapitein's Kloof...........	49	α′ from No. 24, —(42)	254·21·55·482 5·2239372 0·27·29·290	36·46·42·868 37·18·10·604 —·008	74· 4·53·480 —0·31·27·736 —0· 7·30·553	32·42·54·317	—0· 5·37·026
Piket Berg.................	Patrys Berg................	50	α′ from No. 26, +(43)	70·56·25·079 5·2113716 0·26·42·267	54· 8·38·442 54·38·40·926 +·009	108·47·19·359 0·30· 2·484 0· 8·42·111	32·50·24·870	0·25·50·716

§ 8.

Calculation of the Geodetical Latitudes and Longitudes of Points in the Principal Triangulation—(*continued*).

STATION (A).	POINT DETERMINED (B).	No. for Reference.	FORMATION OF AZIMUTH.	α LOG. DISTANCE θ	$\frac{1}{2}(\alpha'+\zeta-\omega)$. $\frac{1}{2}(\alpha'+\zeta+\omega)$. ζ	α' DIFF. IN LONG. DIFF. IN LAT.	LATITUDE.	LONGITUDE.
				° ′ ″	° ′ ″	′ ° ″	° ′ ″	° ′ ″
Piket Berg.............	Eland's Berg................	51	α from No. 50, +(44)	154·53·59·973 5·1674884 0·24· 8·277	12·23·41·072 12·35·48·144 —·009	335· 0·30·775 0·12· 7·072 —0·21·58·376	32·19·44·383	0· 7·55·304
"	Heerenlogement's Berg...	52	α from No. 51, +(47)	181·51·14·709 5·4219342·5 0·43·21·941	0·54·21·197 0·56· 0·433 ·000	1·50·21·630 —0· 1·39·236 —0·43·33·110	31·58· 9·649	—0· 5·51·004
"	Lambert's Hoek Berg....	53	α from No. 51, +(45)	207·14·33·592 5·1968296 0·25·49·504	13·26·31·676 13·40·30·928 —·011	27· 7· 2·615 —0·13·59·252 —0·23· 5·001	32·18·37·758	—0·18·11·020
"	Ceder Berg..................	54	α from No. 52, +(46)	236·52·19·972 5·3544382 0·37· 7·416	27·57·52·236 28·34·40·432 —·026	56·32·32·694 —0·36·48·196 —0·20·28·526	32·21·14·233	—0·40·59·964
Kapitein's Kloof............	Kapoc Berg..................	55	α' from No. 27	11·41·33·680 5·4171706 0·42·53·554	84· 1·10·292 84·11·35·121 +·015	191·47·14·602 0·10·24·829 0·42 11·556	33·25· 5·874	0· 4·47·807
"	Patrys Berg..................	56	α from No. 55, +(50)	74· 4·53·480 5·2239372 0·27·29·301	52·33·18·409 53· 4·46·136 +·008	254·21·55·463 0·31·27·727 0· 7·30·553	32·50·24·871	0·25·50·705
"	Winter Berg................	57	α' from No. 27, —(53)	309· 0·38·069 5·3552781 0·37·11·725	64· 3·41·603 64·38·11·738 +·028	128·41·53·313 —0·34·30·135 —0·23 26·683	33· 6·21·001	—0·40· 7·157
"	Ceder Berg..................	58	α from No. 57, —(51)	234·17·36·862 5·3507308 0·36·48·480	26·41·36·088 27 16·59·021 —·027	53·58·35·136 —0·35·22·933 —0·21·40·100	32·21·14·218	—0·40·59·955
"	Heerenlogement's Berg...	59	α from No. 58, —(52)	180·15·14·684 5·4334494 0·44·31·850	0· 7·26·622 0· 7·40·589 ·000	0·15· 7·211 —0· 0·13 967 —0·44·44·684	31·58· 9·634	—0· 5·50·989
Winter Berg.................	Kapoc Berg..................	60	α' from No. 30	63·22·29·379 5·4074047 0·41·56·277	57·43·58·772 58·28·53·738 +·029	243·47· 7·519 0·44·54·966 0·18·44·873	33·25· 5·875	0· 4·47·805
"	Kapitein's Kloof...........	61	α from No. 60, +(142)	128·41·53·307 5·3552781 0·37·11·679	25·12·25·886 25·46·56·021 —·028	309· 0·38·065 0·34·30·135 —0·23·26·683	32·42·54·319	—0· 5·37·026

Winter Berg................	Ceder Berg......	62	α from No. 61, +(143)	180 56·53·999 5·4370911 0·44·54·292	0·27·46·332 0·28·39·123 ·000	0·56·25·455 —0· 0·52·791 —0·45· 6·783	32·21·14·219	—0·40·59·952
„	Sneeuw Kop................	63	α' from No. 30, —(144)	8·12·57·357 5·5339042 0·56· 7·115	85·46· 0·501 85·55·41·095 +·018	188·18·18·422 0· 9·40·594 0·55·47·634	34· 2· 8·636	—0·30·26·567
Eland's Berg................	Ceder Berg..................	64	α' from No. 47—(57)—(54) α' from No. 51—(54)	272·16·59·255 5·4013492 0·41·21·537	45·30·56·846 46·19·52·109 +·003	91·50·48·952 —0·48·55·263 0· 1·29·849	32·21·14·232	—0 40·59·963
„	Lambert's Hoek Berg....	65	α from No. 64, —(56)+(55)	267·14·54·831 5·1289511 0·22· 5·326	43·17·25·533 43·43·31·859 —·001	87· 0·57·393 —0·26· 6·326 —0· 1· 6·625	32·18·37·758	—0·18·11·026
Ceder Berg......	Heerenlogement's Berg...	66	α' from No. 58+(60) α' from No. 54+(62)	127·30·19·135 5·3598190 0·37·35·226	25·47·54·620 26·23· 3·577 —·028	307·49· 1·775 0·35· 8·957 —0·23· 4·583	31·58· 9·642	—0· 5·51·001
„	Klip Rug.....................	67	α from No. 66, (+angle, Δ 25.)	194·13·47·983 5·4339612 0·44·35·052	6 57· 3·245 7· 9·55·543 —·020	14· 6·58·808 —0·12·52·298 —0·43·26·205	31·37·48·020	—0·53 52·256
Heerenlogement's Berg..	Ceder Berg..................	68	α' from No. 52—(66) α' from No. 59—(65)	307·49· 1·762 5·3598190 0·37·35·271	63·27·35·104 64· 2·44·062 +·029	127·30·19·137 —0·35· 8·958 0·23· 4·583	32·21·14·225	—0·40·59·955
„	Klip Rug.....................	69	α from No. 68, (—angle, Δ 25.)	243·48·30·742 5·4434040 0·45·33·908	31·17·35·574 32· 5·36·831 —·035	63·23·12·440 —0·48· 1·257 —0·20·21·622	31·37·48·020	—0·53·52·254
„	Bokkeveld Berg...........	70	α from No. 69, (—angle, Δ 26.)	201·52·15·585 5·5090557 0·53· 0·062	10·38·33·487 11· 1·37·640 —·041	21·40·11·168 —0·23· 4·153 —0·49·27·729	31· 8·41·913	—0·28·55·150
„	Eland's Hoogte............	71	[α from No. 70, —(67)	164· 0·45·280 5·4779209 0·49·20·062	7·47·31·443 8· 3·24·333 —·028	344· 9· 4·196 0·15·52·890 —0·47·40·498	31·10·29·144	0·10· 1·893
„	Louis Fontein..............	72	α from No. 70, —(68)	152· 1·16·954 5·5883467 1· 3·37·039	13·32·50·680 14· 7·40·422 —·071	332·19·28·827 0·34·49·742 —0·56·32·239	31· 1·37·403	0·28·58·745
Klip Rug.....................	Bokkeveld Berg...........	73	α' from No. 69, (+angle, Δ 26.)	143·33·24·003 5·3404544 0·35·56·959	17·54·19·561 18·19·16·665 —·026	323·46·23·748 0·24·57·104 —0·29· 6·108	31· 8·41·912	—0·28·55·150
Bokkeveld Berg...........	Eland's Hoogte............	74	α' from No. 70, +(71)	86·46·40·223 5·3032209 0·33·22·716	46· 7· 6·725 46·46· 3·760 +·003	267· 6·49·518 0·38·57·035 0· 1·47·232	31·10·29·145	0·10· 1·885
„	Louis Fontein..............	75	α' from No. 70, +(70)	97·49·55·963 5·4844230 0·50· 4·840	40·21· 8·200 41·19· 2·128 —·015	278·19·49·657 0·57·53·928 —0· 7· 4·510	31· 1·37·403	0·28·58·778

§ 8.

CALCULATION OF THE GEODETICAL LATITUDES AND LONGITUDES OF POINTS IN THE PRINCIPAL TRIANGULATION—(*continued*).

STATION (A).	POINT DETERMINED (B).	No. for Reference.	FORMATION OF AZIMUTH.	α LOG. DISTANCE θ	$\frac{1}{2}(\alpha'+\zeta-\omega)$. $\frac{1}{2}(\alpha'+\zeta+\omega)$. ζ	α' DIFF. IN LONG. DIFF. IN LAT.	LATITUDE.	LONGITUDE.
				° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″
Bokkeveld Berg..........	Kamies-Sector Berg......	76	α from No. 75, +(72)	137·53·20·732 5·5861932 1· 3·18·320	20·26· 9·081 21·15·20·831 —·085	318·18·30·003 0·49·11·750 —0·47·21·213	30·21·20·700	0·20·16·600
,,	Keibiskow..................	77	α from No. 76, +(73)	227·42·17·765 5·2245574 0·27·31·794	23·33·11·060 23·56·54·021 —·016	47·30· 5·099 —0·23·42·961 —0·18·39·252	30·50· 2·661	—0·52·38·111
Louis Fontein..............	Kamies-Sector Berg......	78	α' from No. 72, —(76)—(77)	190·36·47·973 5·3951044 0·40·46·276	5·11·49·651 5·20·31·795 —·011	10·32·21·457 —0· 8·42·144 —0·40·16·702	30·21·20·701	0·20·16·601
,,	Roode Wal..................	79	α from No. 78, —(79)	135·37·30·599 5·3822811 0·39·35·101	21·46·56·577 22·19· 5·419 —·034	315·53·57·970 0·32· 8·842 —0·28·30·115	30·33· 7·288	1· 1· 7·587
,,	Ezels Kop..................	80	α from No. 79, +(78)	186· 7·32·829 5·3852335 0·39·51·302	3· 0· 3·051 3· 4·58·799 —·007	6· 5· 1·857 —0· 4·55·748 —0·39·49·590	30·21·47·813	0·24· 2·997
Eland's Hoogte............	Kamies-Sector Berg......	81	α' from No. 71, —(74)—(75)	169·45· 1·640 5·4809641 0·49·40·999	4·59·44·595 5· 9·59·305 —·019	349·50·16·081 0·10·14·710 —0·49· 8·444	30·21·20·700	0·20·16·603
Keibiskow..................	Bokkeveld Berg...........	82	α' from No. 77,	47·30· 5·099 5·2245574 0·27·31·820	65·56·59·647 66·20·42·605 +·016	227·42·17·764 0·23·42·958 0·18·39·252	31· 8·41·913	—0·28·55·153
,,	Boschluis....................	83	α' from No. 77, +(80)+(81)	159·21·47·141 5·5149043 0·53·43·367	10· 2·38·536 10·24·30·241 —·041	339·32·51·182 0·21·51·705 —0·50·33·509	29·59·29·152	—0·30·46·406
Roode Wal..................	Vogel Klip..................	84	α' from No. 79, —(82)—(84)	204· 4·39·164 5·4934267 0·51· 7·880	11·44·16·366 12· 8·18·279 —·042	23·52·34·687 —0·24· 1·913 —0·46·57·291	29·46· 9·997	0·37· 5·674
Ezels Kop....................	Vogel Klip..................	85	α' from No. 80, +(85)+(86)	162·16·54·598 5·3553420 0·37·12·326	8·41·45·291 8·54·47·964 —·018	342·23·26·727 0·13· 2·673 —0·35·37·816	29·46· 9·997	0·37· 5·670
Kamies-Sector Berg......	Bokkeveld Berg...........	86	α' from No. 76, α' from No. 78—(92) α' from No. 81—(91)	318·18·30·010 5·5861932 1· 3·18·474	68·32· 4·537 69·21·16·286 +·087	137·53·20·736 —0·49·11·749 0·47·21·212	31· 8·41·913	—0·28·55·148

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Kamies-Sector Berg......	Keibiskow	87	a from No. 86, —(95)	294·46·28·125 5·6232903 1· 8·57·197	56·28·13·428 57·41· 8·128 +·079	114· 9·21·477 —1·12·54·700 0·28·41·961	30·50· 2·662	—0·52·38 099
"	Boschluis	88	a from No. 87, —(93)	243·58·44·253 5·4767079 0·49·12·050	31·21· 0·831 32·12· 3·833 —·042	63·33· 4·706 —0·51· 3·002 —0·21·51·549	29 59·29·152	—0·30·46·401
"	Koeberg......................	89	a from No. 88, —(94)	205·37· 9·546 5·4003930 0·41·16·332	12·33· 9·530 12·53·42·610 —·029	25·26·52·169 —0·20·33·080 —0·37·25·764	29·43·54·937	—0· 0·16·479
"	Vogel Klip..................	90	a from No. 89, —(99)	157·21· 0·101 5·3634602 0·37·54·449	11· 6·52·649 11·23·41·723 —·022	337·29·25·606 0·16·49·074 —0·35·10 703	29·46· 9·998	0·37· 5·675
"	North End..................	91	a from No. 90, +(98)	210·49·53·572 5·4171014 0·42·53·459	15· 5·56·961 15·31·15·973 —·035	30·37·12·969 —0·25·19·012 —0·37· 3·378	29·44·17·323	—0· 5· 2·411
Vogel Klip..................	Koeberg......................	92	a′ from No. 84, —(88)—(89)	266·12·20·017 5·2968842 0·32·31·250	42·38·12·624 43·15·34·783 —·003	85·53·47·410 —0·37·22·159 —0· 2·15·061	29·43·54·936	—0· 0·16·486
"	North End..................	93	a′ from No. 84, —(88)—(90)	267·15· 0·854 5·3485291 0·36·37·648	43· 5·59·081 43·48· 7·158 —·003	86·54· 6·236 —0·42· 8·077 —0· 1·52·674	29·44·17·323	—0· 5· 2·404
Boschluis....................	Koeberg......................	94	a′ from No. 83, +(105)+(106)	120·13·54·592 5·2711879 0·30·39·128	29·30·12·165 30· 0·42·077 —·019	300·29· 5·739 0·30·29·912 —0·15·34·216	29·43·54·936	—0· 0·16·491

§ 8.

CALCULATION OF THE GEODETICAL LATITUDES AND LONGITUDES OF POINTS IN THE SECONDARY TRIANGULATION.

STATION (A).	POINT DETERMINED (B).	No. for Reference.	FORMATION OF AZIMUTH.	α LOG. DISTANCE θ	$\frac{1}{2}(\alpha'+\zeta-\omega)$. $\frac{1}{2}(\alpha'+\zeta+\omega)$. ζ	α' DIFF. IN LONG. DIFF. IN LAT.	LATITUDE.	LONGITUDE.
				° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″
Royal Observatory........	Tygerberg..................	95	Azimuth of Meridian Mark, (+ angle, △ 66.)	229· 1·53·95 4·6507370 0· 7·20·62	24·25·44·96 24·32·25·59 ·00	48·58·10·55 —0· 6·40·63 —0· 4·50·41	33·51·12·79	—0· 6·40·63
,,	Kogel Berg................	96	α from No. 5, (+ angle, △ 70.)	311·13·57·63 5·2164616 0·27·10·49	65·17·48·42 65·42·22·92 +·01	131· 0·11·32 —0·24·34·50 0·17·50·93	34·13·54·13	—0·24·34·50
,,	Robben Island, ch. tower	97	α from No. 95, (— angle, △ 107.)	146·20·53·04 4·7315929 0· 8·50·80	16·44·57·82 16·50·51·82 ·00	326·24·10·36 0· 5·54·00 —0· 7·24·03	33·48·39·17	0· 5·54·00
,,	Muizenberg.................	98	α from No. 4, (+ angle, △ 94.)	5·12·10·90 4·7827166 0· 9·57·11	87·23· 3·56 87·24· 8·95 ·00	185·12·47·48 0· 1· 5·39 0· 9·57·38	34· 6· 0·58	0· 1· 5·39
Sneeuwkop.................	Tygerberg..................	99	α from No. 11, (+ angle, △ 67.)	118·46·57·94 5·1373555 0·22·31·10	30·17·59·94 30·41·45·88 —·01	299· 0·14·17 0·23·45·94 —0·10·55·85	33·51·12·79	—0· 6·40·63
,,	Kogel Berg	100	α from No. 99, (— angle, △ 72.)	22·30·37·64 4·8876691 0·12·40·33	78·40· 6·36 78·45·58·44 ·00	202·33·55·20 0· 5·52·08 0·11·45·49	34·13·54·12	—0·24·34·49
,,	Table Mountain...........	101	α from No. 9 (— angle, △ 98.) α from No. 12 (+ angle, △ 96.)	98·16·48·86 5·2337640 0·28· 6·93	40·25·26·37 40·58·59·19 —·01	278·35·34·44 0·33·32·82 —0· 4· 8·64	33·58· 0·00	0· 3· 6·25
,,	Noah's Ark, Simon's Bay	102	α from No. 99, (— angle, △ 89.)	70·20·59·65 5·2314589 0·27·58·00	54·24·39·19 54·56·29·66 +·01	250·38·51·15 0·31·50·47 0· 9·22·74	34·11·31·38	0· 1·23·90
,,	Naval Yard, Simon's Tn.	103	α from No. 99, (+ angle, △ 90.)	71·15·48·17 5·2497134 0·29·10·03	53·56· 2·30 54·29·25·86 +·01	251·34·31·85 0·33·23·56 0· 9·20·19	34·11·28·83	0· 2·56·99
,,	Mudge Point...............	104	α from No. 11, (— angle, △ 78.)	339·24·31·16 5·1488883 0·23· 7·46	79·34·33·63 79·44·25·00 +·01	159·18·58·62 —0· 9·51·36 0·21·44·375	34·23·53·011	—0·40·17·93
,,	Danger Point	105	α from No. 11, (— angle, △ 74.)	329·37·33·68 5·3709713 0·38·33·68	74·30·15·76 74·53·56·83 +·03	149·24·12·57 —0·23·41·07 0·33·22·950	34·35·31·586	—0·54· 7·64

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Sneeuwkop......	Zonder Einde Berg........	106	α from No. 105, (− angle, △ 75.)	272·24·43·61 5·4206619 0·43·14·14	45·31·41·56 46·23·50·25 ·00	91·55·31·80 −0·52· 8·69 0· 1·38·627	34· 3·47·263	−1·22·35·26
„	Babylon's Tower...........	107	α from No. 106, (+ angle, △ 82.)	318·41·41·75 5·1468388 0·23· 0·93	69· 6·29·01 69·24·52·69 +·01	138·31·21·69 −0·18·23·68 0·17·20·75	34·19·29·38	−0·48·50·25
„	Zwart Berg, Caledon......	108	α from No. 107, (− angle, △ 84.)	290·10·52·56 5·2164395 0·27· 0·96	54·41·30·85 55·12·10·17 +·01	109 53·41·01 −0·30·39·33 0· 9·17·97	34·11·26·60	−1· 1· 5·90
King's Battery	Robben Island, ch. tower	109	α from No. 18 +(128)−(129) (+ angle, △ 65) (− angle, △ 106.)	156·39·46·38 4·7421987 0· 9· 3·92	11·36·44·86 11·41· 4·19 ·00	356·42·10·95 0· 4·19·33 −0· 8·21·81	33·48·39·17	0· 5·54·00
„	Muizenberg.................	110	α′ from No. 16, (+ angle, △ 93.)	357·24·53 25 4·7371852 0· 8·57·67	88·42· 3·78 88·42·33·07 ·00	177·24·36·85 −0· 0·29·29 0· 8·59·60	34· 6· 0·58	0· 1· 5·38
Zwart Kop..................	Table Mountain............	111	α′ from No. 12, (− angle, △ 96.)	174·30·23·98 4·9769219 0·15·33·79	2·43·23 91 2·45·11·69 ·00	354·31·24·40 0· 1·47·78 −0·15·33·80	33·58· 0·00	0· 3· 6·24
Cape Point..................	Mudge Point................	112	α′ from No. 11, (+ angle, △ 78.)	275· 0·30·76 5·3007199 0·32·48·09	46·59·16·55 47·38·52·62 ·00	94·38· 9·16 −0·39·36·07 0. 2·46·203	34·23·53·009	−0·40·17·93
„	Danger Point...............	113	α′ from No. 11, (+ angle, △ 74.)	288·17·36·69 5·4506464 0·46·19·53	53·26·58·21 54·20·24·00 +·03	107·47·22·18 −0·53·25·79 0·14·24·781	34·35·31·587	−0·54· 7·64
„	Kogel Berg..................	114	α from No. 112, (−angle, △ 79.)	250· 6.59·39 5·1068867 0·20·59.54	34·44·49·78 35· 8·42·43 −·01	69·53·32·22 −0·23·52·65 −0· 7·12·67	34·13·54·13	−0·24·34·50
„	Cape Hanglip, pile.........	115	α from No. 114, (+angle, △ 87.)	273· 3·42·58 5·0102878 0·16·48·35	46·15·57·14 46·36·16·99 ·00	92·52·14·13 −0·20·19·85 0· 0·52·42	34·21·59·22	−0·21· 1·71
„	Cape Hanglip, knob......	116	α′ from No. 11, −(152)+(angle, △ 88.)	272·49·44·10 5·0107998 0·16·49.54	46· 8·56·59 46·29·18·12 ·00	92·38·14·71 −0·20·21·52 0· 0·48·36	34·21·55·17	−0·21· 3·38
Meridian Mark.............	Tygerberg...................	117	α′ from No. 1, (− angle, △ 66.)	319· 9·14·61 4·7131419 0· 8·28·72	69·29·25·55 69·36· 6·20 ·00	139· 5·31·75 −0· 6·40·65 0. 6·26·44	33·51·12·79	−0· 6·40·64
„	Lion's Rump Signal Staff	118	α from No. 117, (+ angle, △ 104.)	19·46·31·31 4·8195636 0·10.49·98	80· 3·18·07 80. 7·43·07 ·00	199·48 58·87 0· 4·25·00 0·10·14·40	33·55· 0.76	0· 4·25·01
Kapoc Berg..................	Table Mountain............	119	α from No. 32 (+ angle, △ 95.) α from No. 33 (+angle, △ 98.)	357·32·43·91 5·3004199 0·32·46·83	88·45· 3·05 88·46 44·61 ·00	177·31·47·65 −0· 1·41·56 0·32·54·12	33·57·59·99	0· 3· 6·25

§ 8.

CALCULATION OF THE GEODETICAL LATITUDES AND LONGITUDES OF POINTS IN THE SECONDARY TRIANGULATION—(*continued*).

STATION (A).	POINT DETERMINED (B).	No. for Reference.	FORMATION OF AZIMUTH.	α LOG. DISTANCE θ	$\frac{1}{2}(\alpha'+\zeta-\omega)$. $\frac{1}{2}(\alpha'+\zeta+\omega)$. ζ	α' DIFF. IN LONG. DIFF. IN LAT.	LATITUDE.	LONGITUDE.
				° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″
Kapoc Berg................	Robben Island, ch. tower	120	α from No. 31, (+ angle, △ 105.)	2·14·16·56 5·1552027 0·23·27·83	88·52· 0·32 88·53· 6.49 ·00	182·14·53·19 0· 1· 6·17 0·23·33·28	33·48·39·15	0· 5·53·98
„	Groote Zwart Berg, Saldanha Bay..............	121	α from No. 28, (− angle, △ 108.)	143·42·21·35 4·9584919 0·14·55·03	18· 0·38·75 18·11·12·03 ·00	323·48· 9·21 0·10·33·28 −0·12· 5·22	33·13· 0·65	0·15·21·09
Riebeek's Kasteel........	Groote Zwart Berg, Saldanha Bay..............	122	α' from No. 31, (+ angle, △ 109.)	104· 9·14·30 5·2861830 0·31·43·40	37·26·54·45 38· 3·40·58 −·01	284·29·24·96 0·36·46·12 −0· 7·53·07	33·13· 0·65	0·15·21·10
Kapitein's Kloof...........	Donkin's Bay..............	123	α from No. 58, (− angle, △ 111.)	161·38·58·64 5·4753415 0·49· 2·42	8· 56·33·03 9. 14·44·60 −·03	341·48·42·34 0.18·11·57 −0·46.47·56	31·56· 6·76	0·12·34·55
Eland's Berg................	Lambert's Bay............	124	α from No. 65, (− angle, △ 110.)	171· 4·16·69 4.9467755 0·14·31·26	4· 25·49·31 4· 28·28·92 ·00	351· 5·41·77 0· 2·39·61 −0·14·24·87	32· 5·19·51	0·10·34·91
Lambert's Hoek Berg....	Lambert's Bay............	125	α' from No. 65, (+ angle, △ 110.)	118·24·57·71 5·2274032 0·27·42·55	30·25·28·33 30·54·14·25 −·01	298·40·17·41 0·28·45·93 −0·13·18·25	32· 5·19·51	0·10·34·91
„	Klip Rug, kop.............	126	α' from No. 65, +(58)+(angle, △ 114.)	217·44·37·60 5·4978570 0·51·39·05	18·23·55·03 19· 1· 2·93 −·05	37·24·58·01 −0·37· 7·91 −0·41· 7·95	31·37·29·81	−0·55·18·93
Ceder Berg......	Donkin's Bay..............	127	α from No. 66, (+ angle, △ 111)−(60)	118·37·32·42 5·4990790 0·51·47·78	30· 0·11·35 30·53·45 86 −·05	299· 6· 2·74 0·53·34·51 −0·25· 7·47	31·56· 6·76	0·12·34·55
Heerenlogement's Berg...	Klip Rug, kop.............	128	α from No. 70, (+ angle, △ 112.)	244· 9· 8·32 5·4550339 0·46·48·11	31·26·48·19 32·16·16·18 −·04	63·43· 4·41 −0·49·27·99 −0·20·39·87	31·37·29·77	−0·55·18·99
Bokkeveld Berg..........	Klip Rug, kop.............	129	α from No. 77, (+ angle, △ 113.)	321·55·59·77 5·3465245 0·36·27·37	70·37·55·55 71· 4·19·40 +·03	141·42·14·92 −0·26·23·85 0·28·47·81	31·37·29·72	−0·55·19·00
„	Groote Toren B., Hantam	130	α' from No. 73, (− angle, △ 115,)	287·41·14·07 5·3662144 0·38· 8·83	53·18·18·43 54· 0·51·49 +·02	107·19· 9·87 −0·42·33·06 0·11·31·78	31·20·13·69	−1·11·28·21

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Bokkeveld Berg............	Spion Berg.	131	α′ from No. 73, (− angle, △ 116.)	257·44·37·75 5·4115064 0·42·20·42	38·15·43·60 39· 3·59·58 —·02	77·19·43·20 —0·48·15·98 —0· 9·10·99	30·59·30·92	—1·17·11·13
Klip Rug......................	Groote Toren B., Hantam	132	α from No. 73, (+ angle, △ 115.)	220·42·54·90 5·1473237 0·23· 2·64	20· 8· 3·73 20·25·39·68 —·01	40·33·43·42 —0·17·35·95 —0·17·34·33	31·20·13·69	—1·11·28·20
"	Spion Berg..................	133	α from No. 73, (+ angle, △ 116.)	207·42·12·10 5·4181355 0·42·59·42	13·33·23·09 13·56·41·97 —·03	27·30· 5·09 —0·23·18·88 —0·38·17·10	30·59·30·92	—1·17·11·13
Tygerberg....................	Lion's Rump Signal Stat.	134	α′ from No. 117, (− angle, △ 104.)	67·37·22·99 4·7829011 0· 9 57·36	56· 2·40·13 56·13·45·76 ·00	247·43·34·10 0·11· 5·63 0· 3·47·97	33·55· 0·76	0· 4·25·00
"	Naval Yard, Simon's Tn.	135	α′ from No. 99, (+ angle, △ 90.)	21·32· 4·37 5·1211775 0·21·41.70	79· 6·27·40 79·16· 5·03 +·01	201·37·27·58 0· 9·37·63 0·20·16·04	34·11·28·83	0· 2·57·00
"	Noah's Ark, Simon's Bay	136	α′ from No. 99, (+ angle, △ 89.)	18·16·51·55 5·1131126 0·21·17·76	80·45·16·40 80·53·20·93 ·00	198·21·22·67 0· 8· 4·53 0·20·18·59	34·11·31·38	0· 1·23·90
"	Naval Yard, clock tower	137	α′ from No. 99, (+ angles, △'s 72 & 92.)	21·29·12·60 5·1215558 0·21·42·84	79· 7·53·85 79·17·30·76 ·00	201·34·35·38 0· 9·36·91 0·20·17·50	34·11·30·29	0· 2·56·28
Kogel Berg....	Naval Yard, clock tower	138	α′ from No. 100, (− angles, △'s 72 & 92.)	95·51·28·72 5·1442218 0·22·52·62	41·42·46·18 42·10·16·96 ·00	276· 6·56·86 0·27·30·78 —0· 2·23·82	34·11·30·30	0· 2·56·28
Danger Point...............	Zonder-Einde Berg.......	139	α′ from No. 105, (+ angle, △ 75.)	216·46·48·71 5·3800730 0·39·22·61	18· 1· 9·04 18·29·36·66 —·03	36·30·45·74 —0·28·27·62 —0·31·44·322	34· 3·47·264	—1·22·35·26
"	Cape L'Agulhas............	140	α from No. 139, (+ angle, △ 76.)	293·35·54·15 5·3142724 0·33·50·44	56·18·18·74 56·56· 5·09 +·02	113·14·23·81 —0·37 46·36 0·13·30·677	34·49· 2·263	—1·31·54·00
"	Babylon's Tower..........	141	α from No. 139, (−angle, △ 83.)	164·41·38·46 5·0036038 0·16·32·94	7·35· 2·28 7·40·19·67 ·00	344·44·38·05 0· 5·17·39 —0·16· 2·21	34·19·29·37	—0·48·50·25
"	Zwart Berg, Caledon......	142	α from No. 141, (+ angle, △ 85.)	193·31·36·22 5·1767234 0·24·39·25	6·40·20·83 6·47·19·12 ·00	13·27·39·95 —0· 6·58·29 —0·24· 5·01	34·11·26 58	—1· 1· 5·93
Babylon's Tower..........	Gunner's Quoin............	143	α′ from No. 141, (− angle, △ 83.) (+ angle, △ 86.)	324·55· 3·33 5·2509339 0·29·14·93	72·11·30·30 72·31·57·50 +·02	144·43·27·78 —0·20·27·20 0·24· 0·93	34·43·30·30	—1· 9·17·45
Zonder-Einde Berg........	Cape L'Agulhas............	144	α′ from No. 139, (− angle, △ 76.)	350·22· 4·57 5·4446905 0·45·41·71	85· 3·44·92 85·13· 3·66 +·01	170·16·48·56 —0· 9·18·74 0·45·15·001	34·49· 2·264	—1·31·54·00

§ 8.

CALCULATION OF THE GEODETICAL LATITUDES AND LONGITUDES OF POINTS IN THE SECONDARY TRIANGULATION.

STATION (A).	POINT DETERMINED (B).	No. for Reference.	FORMATION OF AZIMUTH.	α LOG. DISTANCE θ	$\frac{1}{2}(\alpha'+\zeta-\omega)$. $\frac{1}{2}(\alpha'+\zeta+\omega)$. ζ	α' DIFF. IN LONG. DIFF. IN LAT.	LATITUDE.	LONGITUDE.
				° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″
Zonder Einde Berg........	Pot Berg.....................	145	α from No. 144, (− angle, △ 77.)	297·45·20·25 5·3842907 0·39·45·73	58·19·22·07 59· 1·59·85 +·03	117·21·21·89 −0·42·37·79 0·18·28·75	34·22·16·01	−2· 5·13·05
”	Gunner's Quoin............	146	α' from No. 106, (− angles, △'s 82 & 86.)	15·26·52·39 5·3979370 0·41· 1·89	82· 6· 9·57 82·19·27·38 +·02	195·34·23·07 0·13·17·80 0·39·43·04	34·43·30·30	−1· 9·17·46
Cape L'Agulhas............	Pot Berg.....................	147	α' from No. 144, (+ angle, △ 77.)	225·58 53·44 5·3673698 0·38·14·48	22·33·19·69 23· 6·38·74 −·03	45·39·58·46 −0·33·19·05 −0·26·46·25	34·22·16·01	−2· 5·13·05

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NAME.	LATITUDE.	LONGITUDE.	Reference to the number in the preceding Abstract.	LOG. $\frac{1}{\nu \text{ SIN. } 1''}$	LOG. $\frac{1}{\rho \text{ SIN. } 1''}$
Koe Berg	29·43·54·935	−0· 0·16·482	89, 92, 94	7·9934298	7·9956234
North End	29·44·17·323	−0· 5· 2·408	91, 93	4297	6229
Vogel Klip	29·46· 9·997	+0·37· 5·673	84, 85, 90	4290	6209
Boschluis	29·59·29·152	−0·30·46·403	83, 88	4241	6064
Kamies-Sector Berg	30·21·20·701	+0·20·16·601	76, 78, 81	4159	5823
Ezels Kop	30·21·47·813	+0·24· 2·997	80	4158	5818
Roode Wal	30·33· 7·288	+1· 1· 7·587	79	4117	5693
Keibiskow	30·50· 2·661	−0·52·38·111	77, 87	4054	5505
Spion Berg	30·59·30·920	−1·17·11·130	131, 133	4018	5400
Louis Fontein	31· 1·37·403	+0·28·58·745	72, 75	4010	5376
Bokkeveld Berg	31· 8·41·913	−0·28·55·150	70, 73, 82, 86	3984	5297
Eland's Hoogte	31·10·29 144	+0·10· 1·893	71, 74	3977	5277
Groote Toren Berg (Hantam)	31·20·13 690	−1·11·28·210	130, 132	3940	5167
Klip Rug, kop	31·37·29·750	−0·55·18·990	126, 128, 129	3876	4971
Klip Rug Station	31·37·48·020	−0·53·52·254	67, 69	3875	4968
Donkin's Bay	31·56· 6·765	+0·12·34·550	123, 127	3806	4760
Heerenlogement's Berg	31·58· 9·642	−0· 5·50·997	52, 59, 66	3798	4737
Lambert's Bay	32· 5·19·510	+0·10·34·905	124, 125	3771	4655
Lambert's Hoek Berg	32·18·37·758	−0·18·11·023	53, 65	3720	4503
Eland's Berg	32·19·44·383	+0· 7·55·300	47, 51	3716	4490
Ceder Berg	32·21·14·225	−0·40·59·958	54, 58, 62, 64, 68	3710	4473
Piket Berg	32·41·42·759	−0· 4·11·768	26, 39, 45, 48	3632	4239
Kapitein's Kloof	32·42·54·318	−0· 5·37·022	27, 49, 61	3627	4225
Patrys Berg	32·50·24·870	+0·25·50·710	24, 44, 50, 56	3598	4138
Zwart Berg	33· 3·14·286	−0·12· 3·776	29, 38	3549	3991
Winter Berg	33· 6·21·002	−0·40· 7·161	10, 30, 57	3537	3955
Groote Zwart Berg, Saldanha Bay	33·13· 0·650	+0·15·21·095	121, 122	3511	3877
East End of Base Line	33·13·55 650	−0· 1·52·270	28, 37, 41	3508	3867
West End of Base Line	33·16· 9·995	+0· 6· 5·944	25	3499	3841
Riebeek's Kasteel	33·20·53·707	−0·21·25·020	3, 31	3480	3786
Drie Fontein	33·21·20·320	−0·14·19·530	43, 46	3479	3780
Klip Fontein, Contra Berg	33·24·39 006	+0· 0· 2·395	40, 42	3466	3742
Kapoc Berg	33·25· 5·874	+0· 4·47·810	2, 9, 18, 55, 60	3464	3736
Meridian Mark	33·44 46·351	+0· 0· 0·012	1	3388	3506
Robben Island, church tower	33·48·39·160	+0· 5·53·990	97, 109, 120	3372	3460
Tyger Berg	33·51·12·790	−0· 6·40·630	95, 99, 117	3362	3431
Simon's Berg	33·51·49·698	−0·25·49·604	4, 32	3360	3424
Lion's Rump Signal Staff	33·55· 0·760	+0· 4·25·000	118, 134	3347	3386
Rogge Bay	33·55·16·217	+0· 3·13 860	17, 23, 36	3347	3383
Royal Observatory	33·56 3·200	0· 0· 0·000	8, 14, 22, 34	3344	3374
King's Battery	33·57· 0·976	+0· 1·34·673	13, 16, 21, 35	3340	3363
Table Mountain, pile	33·58· 0·000	+0· 3· 6·250	101, 111, 119	3336	3351
Sneeuw Kop	34· 2· 8·636	−0·30·26·569	5, 20, 33, 63	3320	3303
Zonder Einde Berg	34· 3·47 263	−1·22·35·260	106, 139	3313	3284
Muizenberg	34· 6· 0·580	+0· 1· 5 380	98, 110	3305	3258
Zwart Berg, Caledon	34·11·26 590	−1· 1· 5·910	108, 142	3283	3194
Naval Yard Station	34·11·28·830	+0· 2·56·995	103, 135	3283	3193
Naval Yard, clock tower	34·11·30·300	+0· 2·56·285	137, 138	3283	3193
Noah's Ark Rock, Simon's Bay	34·11·31·380	+0· 1·23·905	102, 136	3283	3193
Zwart Kop	34·13·33·798	+0· 1·18·460	7, 12	3275	3169
Kogel Berg	34·13·54·126	−0·24·34·500	96, 100, 114	3274	3165
Babylon's Tower	34·19·29·375	−0·48·50·255	107, 141	3252	3099
Cape Point	34·21· 6·806	−0· 0·41·855	6, 11, 15, 19	3246	3080
Cape Hanglip (knob)	34·21·55·170	−0·21· 3·380	116	3242	3069
Cape Hanglip (pile)	34 21·59 220	−0·21· 1·710	115	3242	3069
Pot Berg	34·22·16·010	−2· 5·13 050	145, 147	3241	3066
Mudge Point	34·23·53·010	−0·40·17·930	104, 112	3234	3047
Danger Point	34·35·31·586	−0·54· 7 637	105, 113	3188	2909
Gunner's Quoin	34·43·30·303	−1· 9·17·455	143, 146	3157	2815
Cape L'Agulhas	34·49· 2·263	−1·31·54·000	140, 144	7·9933135	7·9952750

§ 8.

The formulæ employed in the calculation of the differences in Latitude and Longitude are those given in the "Account of Principal Triangulation of the Ordnance Survey and Great Britain, by Sir H. James, R.E., 1858."

$$\theta = \frac{s}{\nu \sin. 1''} + \frac{e^2\theta^3 \sin.^2 1''}{6\,(1-e^2)}.\ \cos.^2\lambda.\ \cos.^2 a$$

$$\zeta = \frac{e^2\theta^2 \sin. 1''}{4\,(1-e^2)}.\ \cos.^2\lambda.\ \sin. 2\,a$$

$$\tan. \tfrac{1}{2}\,(a'+\zeta-\omega) = \frac{\sin. \frac{1}{2}\,(\gamma-\theta)}{\sin. \frac{1}{2}\,(\gamma+\theta)}.\ \cot. \tfrac{1}{2}\,a$$

$$\tan. \tfrac{1}{2}\,(a'+\zeta+\omega) = \frac{\cos. \frac{1}{2}\,(\gamma-\theta)}{\cos. \frac{1}{2}\,(\gamma+\theta)}.\ \cot. \tfrac{1}{2}\,a$$

$$\lambda'-\lambda = \frac{s}{\rho \sin. 1''}.\ \frac{\text{Sin.} \frac{1}{2}\,(a'+\zeta-a)}{\text{Sin.} \frac{1}{2}\,(a'+\zeta+a)}.\ \left(1 + \frac{\theta^2 \sin. 1''}{12}.\ \cos.^2 \tfrac{1}{2}\,(a'-a)\right)$$

Where s is the distance A.B. measured on the surface of the earth, (A being the given point, and B that whose lat. &c., are required.)

ν...normal to minor axis at A.
θ...angle subtended at the foot of this normal by the curve s.
a...azimuth of B at A.
a'..azimuth of A at B.
λ...latitude of A; $\gamma=90^\circ-\lambda$.
λ'..latitude of B.
ω...difference in longitude.
ρ...radius of curvature of the meridian for lat. $\frac{1}{2}\,(\lambda+\lambda')$.

The second term of the expression for θ is insensible for the Cape arc, where 7 fig. logarithms are employed; and the greatest value of ζ is $\cdot 0\dot{8}7$.

SECTION IX.

OBSERVED ZENITH DISTANCES OF STATIONS

AND

CALCULATION OF THEIR ALTITUDES.

The letters D and B in the third column distinguish the instruments employed in the measurement of the zenith distances,—viz., the Dollond repeating circle and the Beaufort theodolite.

In the eighth column is given the height of the object observed above the surface of the station; and when the object was a heliostat, the letter H is annexed to the name of the station in column five.

The observations with the Dollond circle were for the most part made at excentric stations, and require on this account special reductions to the trigonometric or angle point.

The reductions given in the last column are obtained as follows:—Let d be the horizontal distance of the instrument from the angle point, and a its height above it; also let h be the height of the object observed above the surface, s the distance of the stations, and γ the angle at the "angle point" between the repeating-circle and the object, measured from left to right; then the correction to an observed zenith distance z, $= \dfrac{d \cos \gamma \cos. z}{s \sin. 1''} + \dfrac{(h-a) \sin. z}{s \sin. 1''}$.

§ 9.

Observed Zenith Distances of Stations.

DATE.	HOUR.	Instrument employed.	No. for Reference.	STATION OBSERVED.	OBSERVED ZEN. DIST.	No. of Observations.	Height of Object observed above the Surface.	Correction to Z.D.
				West End of Base Line $\left\{ \begin{array}{l} a = 2{\cdot}6 \text{ ft.} \\ d = 26{\cdot}0 \end{array} \right.$				
	h				° ′ ″		ft	″
1841. Nov. 5	4 p.m.	D	1	East End..................H	89·59·68·2	16	2·3	− 2·8
6	6¾ a.m.			(γ = 21°·2′).	55·2	12	,,	,,
8	5½ p.m.				35·9	16	,,	,,
3	noon	D	2	Kapoc Berg.................	88·42·51·7	12	0·0	−11·0
3				Top of Signal Rock.	51·1	4	,,	,,
3				(γ = 122°·30′).	26·2	16	,,	,,
3					15·7	16	,,	,,
6	p.m.				22·8	16	,,	,,
3		D	3	Klip Fontein, Contre Brg.	89·41·55·4	12	0·0	− 8·9
4	8 a.m.			(γ = 98°·34′).	42·38·0	10	,,	,,
6	6 p.m.				42·14·7	8	,,	,,
				East End of Base Line $\left\{ \begin{array}{l} a = +2{\cdot}3 \text{ ft.} \\ d = 24{\cdot}67 \end{array} \right.$				
Nov. 15	6½ a.m.	D	4	Kapoc Berg..................	89· 7·56·2	20	0·0	+ 2·0
16	7 a.m.			Top of Signal Rock.	8·29·2	10	,,	,,
27	6½ p.m.			(γ = 324°·56′).	8·35·3	10	,,	,,
29	7½ a.m.				8·18·0	8	,,	,,
29	9 a.m.				8·37·0	4	,,	,,
29	4½ p.m.				8·46·6	16	,,	,,
Dec. 2	7 a.m.	D	5	Groote Zwart Berg.....H (γ = 102°·1′).	89·38·55·1	32	2·5	+ 0·5
Nov. 15	8 a.m.	D	6	Contre Berg Rock.........	89· 9· 1·3	12	0·0	− 5·1
30	7 a.m.			(γ = 16°·13′).	32·9	16	,,	,,
Nov. 15		D	7	Zwart Berg..................	89·11·17·1	8	0·0	− 5·7
17				(γ = 227°·15′). H	10·52·6	16	2·5	− 0·5
19	4⅓ p.m.			H	11·17·1	20	,,	− 0·5
Nov. 18		D	8	Baviaan's Berg Rock.....	89· 9· 2·4	12	0·0	− 4·1
30	5⅔ p.m.			(γ = 7°·32′).	37·7	12	,,	,,

DATE.	HOUR.	Instrument employed.	No. for Reference.	STATION OBSERVED.	OBSERVED ZEN. DIST.	No. of Observations.	Height of Object observed above the Surface.	Correction to Z.D.
				East End of Base Line—(*continued*).				
	h				° ′ ″		ft	″
1841. Nov. 19	6⅓ p.m.	D	9	Riebeek's Kasteel..........	88·36·47·0	20	0·0	− 3·8
20	5½ p.m.			(γ = 301°·34′).	37· 2·8	16	,,	− 3·8
25	10½ a.m.			H	37·23·1	24	2·5	+ 1·0
25	4½ p.m.			H	37· 5·4	24	,,	+ 1·0
Nov. 20	6½ p.m.	D	10	Winter Berg...............	88·21·20·4	12	0·0	− 2·4
22	5½ p.m.			(γ = 90°).	34·0	12	,,	
27	8 a.m.				38·7	4	,,	
Nov. 20	8 a.m.	D	11	Drie Fontein.............H	89·38·38·8	16	2·5	+ 0·8
22	7½ a.m.			(γ = 313°·51′). H	28·4	20	,,	
Nov. 19	a.m.	D	12	West End of Base.........	90· 7 10·2	8	0·0	−11·1
20	5½ a.m.			(γ = 79°·57′)	6·50·2	8	,,	
22	6 a.m.				5·38·9	18	,,	
23	6¼ a.m.				7· 7·3	4	,,	
Nov. 24	6 p.m.	D	13	Klip Fontein, Contre B..H	89·46·55·2	8	2·5	+ 1·0
25	7 a.m.			(γ = 16°·59′). H	46·16·1	28	,,	,,
29	6 p.m.			H	47·23·1	4	,,	,,
				Klip Fontein, Contre Berg $\left\{ \begin{array}{l} a = +4{\cdot}3 \text{ ft.} \\ d = 42 \end{array} \right.$				
Dec. 8	4¾ p.m.	D	14	West End of Base......H	90·26·62·0	12	2·5	− 5·1
9	7½ a.m.			(γ = 166°·16′). H	56·9	4	,,	,,
11	5 p.m.			H	60·9	4	,,	,,
11	6 p.m.			H	52·4	8	,,	,,
Dec. 10	6 a.m.	D	15	Riebeek's Kasteel.......H	88·50· 9·7	12	2·5	− 3·3
10	4½ p.m.			(γ = 90°). H	45·6	12	,,	,,
Dec. 8	6½ p.m.	D	16	Drie Fontein.............H	89·52·45·1	12	2·5	− 5·1
9	6½ a.m.			(γ = 271°·56′). H	30·4	12	,,	,,
10	8½ a.m.			H	56·5	16	,,	,,

§ 9.

Klip Fontein, Contre Berg—(*continued*).

Dec. 10	$7\frac{1}{2}$ a.m.	D	17	Zwart Berg..............H	89·46·48·0	16	2·5	− 2·8
10	$5\frac{1}{2}$ p.m.			($\gamma = 222°·42'$). H	49·3	10	,,	,,
Dec. 10	$6\frac{1}{3}$ p.m.	D	18	East End of Base........H	90·22·37·0	12	2·5	− 6·5
11	$6\frac{1}{2}$ p.m.			($\gamma = 205°·45'$). H	36·3	12	,,	,,

Kapoc Berg { For Dollond Circle, $a = -5·3$ ft., $d = 40·2$ ft.
For Beaufort Theodolite, centered over angle point, $a = +4·3$.

Dec. 22	8 a.m.	D	19	East End of Base........H	91· 1·52·7	4	2·5	+21·2
22	6 p.m.			($\gamma = 271°·22'$). H	1·37·3	12	,,	,,
23	4 p.m.			H	2· 6·9	12	,,	,,
29	$10\frac{1}{2}$ a.m.			H	1·58·8	10	,,	,,
1842. Jan. 1	7 a.m.			H	1·50·9	16	,,	,,
4	10 a.m.			H	2· 3·3	12	,,	,,
5	$10\frac{1}{2}$ a.m.			H	2·13·4	8	,,	,,
6	6 p.m.			H	1·43·3	8	,,	,,
1841. Dec. 23	5 p.m.	D	20	Riebeek's Kasteel.......H	89·29· 1·9	16	2·5	+12·2
29	$4\frac{1}{2}$ p.m.			($\gamma = 324°·2'$). H	28·55·5	12	,,	,,
1842. Jan. 1	$10\frac{1}{2}$ a.m.			H	28·51·1	4	,,	,,
1	$5\frac{1}{2}$ p.m.			H	28·18·8	24	,,	,,
1848. Mar. 6	$10\frac{1}{2}$ a.m. to $4\frac{1}{2}$ p.m.	B			29·36·0	10	0·0	− 6·5
1841. Dec. 29	$5\frac{1}{3}$ p.m.	D	21	Klip Fontein, Sec. St. H	90·33· 5·9	12	2·5	+ 6·2
1842. Jan. 3	$4\frac{1}{2}$ p.m.			H	33·20·0	20	,,	,,
5	$5\frac{1}{2}$ p.m.			($\gamma = 250°·11'$). H	33·22·0	14	,,	,,
6	4 p.m.			H	33· 8·5	6	,,	,,
7	8 a.m.			H	33·21·3	6	,,	,,
1841. Dec. 29	$6\frac{1}{2}$ p.m.	D	22	Zwart Berg..............H	90· 9 23·2	12	2·5	+10·2
1842. Jan. 3	6 p.m.			($\gamma = 277°·46'$). H	26·5	16	,,	+10·2
4	$5\frac{1}{3}$ p.m.			H	0·5	12	,,	+10·2
6	$5\frac{1}{3}$ p.m.			H	29·0	12	,,	+10·2
7	7 a.m.			H	11·1	16	,,	+10·2
1848. Mar. 6	$10\frac{1}{2}$ a.m. to $4\frac{1}{2}$ p.m.	B			57·0	9	0·0	− 5·6
1842. Jan. 10	$5\frac{1}{2}$ p.m.	D	23	Winter Berg.............. ($\gamma = 308°·31'$).	89· 5·48·7	8	0·0	+ 4·6
1848. Mar. 6	$10\frac{1}{2}$ a.m. to $4\frac{1}{2}$ p.m.	B			7· 0·0	10	,,	− 3·5

Kapoc Berg—(*continued*).

1842. Jan. 18	$6\frac{1}{2}$ p.m.	D	24	Patrys Berg.............H ($\gamma = 90°·0'$).	90·25·21·0	20	2·5	+ 6·6
1848. Mar. 6	$11\frac{1}{2}$ a.m.	B	25	Kapitein's Kloof...........	89·53·32·0	4	0·0	− 3·4
1848. Mar. 6	$10\frac{1}{2}$ a.m. to $4\frac{1}{2}$ p.m.	B	26	Sneeuwkop.................	89·36 15·0	5	0·0	− 3·1

Riebeek's Kasteel { $a = -2·3$ ft.
$d = 40·8$

1842. Feb. 22	a.m.	D	27	Kapoc Berg..............H	90·50·14·7	12	2·5	+ 2·7
24	10 a.m.			($\gamma = 339°·51'$). H	49·57·0	16	,,	,,
Mar. 17	4 p.m.			H	50·15·0	16	,,	,,
Feb. 23	5 p.m.	D	28	Zwart Berg..............H	90·52·58·1	4	2·5	+ 7·8
24	$8\frac{1}{2}$ a.m.			($\gamma = 56°·44'$). H	57·7	16	,,	,,
Feb. 24	a.m.	D	29	East End of Base........H	91·37 54·2	16	2·5	+ 7·0
26	5 p.m.			($\gamma = 346°·18'$). H	38·29·9	12	,,	,,
27	10 a.m.			H	38·14·3	20	,,	,,
Mar. 7	$8\frac{1}{2}$ a.m.	D	30	Royal Observatory......H	91· 0·29·8	8	2·5	+ 4·0
7	$10\frac{1}{2}$ a.m.			($\gamma = 287°·42'$). H	59·8	12	,,	,,
Mar. 7	5 p.m.	D	31	Klip Fontein, Granary.H	90·54· 7·4	8	2·5	+ 3·5
14	10 a.m.			H ($\gamma = 55°·57'$).	28·5	12	,,	,,
Mar. 9	$10\frac{1}{2}$ a.m.	D	32	Piket Berg................H	90·21·27·5	16	2·5	+ 2·9
10	$10\frac{1}{2}$ a.m.			($\gamma = 60°·24'$). H	9·5	10	,,	,,
10	4 p.m.			H	43·7	8	,,	,,
10	$4\frac{1}{2}$ p m.			H	29·4	4	,,	,,
Feb. 24	p.m.	D	33	Winter Berg	88·31· 1·5	8	0·0	+ 2·7
Mar. 17	11 a.m.			($\gamma = 128°·7'$).	1·1	12	,,	,,
Mar. 16	$10\frac{1}{2}$ a.m.	D	34	Rogge Bay................H	91· 0·20 6	16	2·5	+ 3·9
16	4 p.m.			($\gamma = 291°·38'$). H	91· 0·20·7	4	,,	,,
17	10 a.m.			H	90·59 51·2	12	,,	,,
Mar. 16	$0\frac{1}{2}$ p.m.	D	35	Baviaan's Berg Rock..... ($\gamma = 321°·56'$).	90·46·33·6	12	0·0	+ 3·5
Mar. 16	$1\frac{3}{4}$ p.m.	D	36	Contre Berg Rock......... ($\gamma = 332°·19'$).	90·53· 0·5	12	0·0	+ 3·1

OBSERVED ZENITH DISTANCES OF STATIONS—(*continued*).

DATE.	HOUR.	Instrument employed.	No. for Reference.	STATION OBSERVED.	OBSERVED ZEN. DIST.	No. of Observations.	Height of Object observed above the Surface.	Correction to Z.D.
				Zwart Berg { $a = +$ 3·92 ft. $d =$ 19·76.				
1842.					° ′ ″		ft	″
April 16	8 a.m.	D	37	Drie Fontein.............H	90·28·50·1	16	2·5	− 2·8
16	4 p.m.			($\gamma = 40°·10'$). H	29·47·7	16	„	„
April 16	10 a.m.	D	38	East End of Base........H	91· 0·35·5	16	2·5	− 3·6
17	9 a.m.			($\gamma = 84°·51'$). H	23·9	20	„	„
18	10½ a.m.			H	52·3	12	„	„
April 17	10½ a.m.	D	39	Kapoc Berg..............H	90·12·24·6	12	2·5	− 1·8
17	4½ p.m.			($\gamma = 79°·2'$). H	58·7	20	„	„
19	4 p.m.			H	47·4	16	„	„
April 18	7 a.m.	D	40	Riebeek's Kasteel.......H	89·23·15·6	12	2·5	− 2·1
18	9 a.m.			($\gamma = 22°·12'$). H	36·4	20	„	„
18	4 p.m.			H	35·0	20	„	„
				Klip Fontein Sector Station { $a = +$ 4· 2 ft. $d =$ 14·65.				
May 7	10½ a.m.	D	41	Patrys Berg..............H	89·58·36·6	16	2·5	− 2·5
7	4 p.m.			($\gamma = 343°·0'$). H	34·2	20	„	„
May 31	4¾ p.m.	D	42	Zwart Berg..............H	89·41·39·1	4	2·5	− 2·4
June 1	11¼ a.m.			($\gamma = 283°·8'$). H	32 9	8	„	„
				Piket Berg { $a = -$ 1· 5 ft. $d =$ 70·75.				
June 5	4½ p.m.	D	43	Patrys Berg............. H	90·53· 5·6	8	2·5	+ 4·4
6	9¾ a.m.			($\gamma = 307°·4'$). H	52·56 3	8	„	„
13	7¾ a.m.			H	52·34·8	20	„	„
14	11½ a.m.			H	53·13·1	12	„	„
				Piket Berg—(*continued*).				
1842.					° ′ ″		ft	″
June 6	3½ p.m.	D	44	Zwart Berg...............H	90·41·43·6	20	2·5	+ 7·1
				($\gamma = 219°·2'$).				
June 9	10⅓ a.m.	D	45	Kapoc Berg..............H	90·35·44·0	12	2·5	+ 3·3
	4⅓ p.m.			($\gamma = 246°·0'$). H	36·11·3	16	„	„
June 11	4⅔ p.m.	D	46	Riebeek's Kasteel.......H	90·14·28·1	12	2·5	+ 3·3
12	11 a.m.			($\gamma = 215°·54'$). H	11 3	8	„	„
12	4½ p.m.			H	21·4	12	„	„
June 13	11½ a.m.	D	47	Eland's Berg............H	91· 1·57·0	20	2·5	+ 4·1
13	p.m.			($\gamma = 31°·2'$). H	2· 6·1	12	„	„
14	10½ a.m.			H	1·57·0	16	„	„
				Eland's Berg { Theodolite centered over angle point. $a = +$ 4·0 feet.				
1843.								
Jan. 27	5¼ p.m.	D	48	Heerenlogement's Berg...	89·30·10·6	12	0·0	− 5·5
Feb. 16	6½ a.m.	D	49	Piket Berg.................	89·18· 6·0	8	„	− 5·6
16	7 a.m.	D	50	Lambert's Hoek Berg....	88·53·33·3	8	„	− 6·1
				Lambert's Hoek Berg { $a = +$ 1·9 ft. $d =$ 56·3.				
Feb. 23	2½ p.m.	D	51	Heerenlogement's Berg...	90·39·48·8	12	0·0	− 3·7
				($\gamma = 12°·35'·5$).				
27	10½ a.m.	D	52	Eland's Berg............H	91·25·11·8	12	2·5	− 0·4
				$\gamma = (306·48·5)$.				
28	11½ a.m.	D	53	Piket Berg..................	90·27·54·3	12	0·0	− 2·3
				($\gamma = 246°·54'·5$).				

Lambert's Hoek Berg—(*continued*).

1843. Feb. 23	$1\frac{1}{3}$ p.m.	D	54	Klip Rug, kop............ ($\gamma = 77^\circ 32'$).	90·17·31·6	12	0·0	— 1·3

Ceder Berg { Both Theodolites centered over the angle point, for D, $a = 4{\cdot}0$ feet, and for B, $a = 4{\cdot}3$ feet.

April 3	a.m.	D	55	Lambert's Hoek Berg....	91·27·51·0	12	0·0	— 7·0
3	$11\frac{1}{2}$ a.m	D	56	Piket Berg..................	91· 9· 6·2	12	0·0	— 3·6
1847. Nov. 25	$7\frac{1}{2}$ a.m. to $5\frac{1}{2}$ p.m.	B		„	9·17·0	11	0·0	— 3·9
1843. April 3	$0\frac{1}{2}$ p.m.	D	57	Heerenlogement's Berg..	91·15·23·0	12	0·0	— 3·6
1847. Nov. 25	$7\frac{1}{2}$ a.m. to $5\frac{1}{2}$ p.m.	B		„ H	15·49·0	9	2·5	— 1·6
25	„	B	58	Winter Berg.............H	90·14·48·0	9	2·5	— 1·4
25	„	B	59	Kapitein's Kloof...........	91· 0·35·0	11	0 0	— 4·0
25	„	B	60	Klip Rug..................H	90·51·25·0	11	2·5	— 1·4
25	6 a.m.	B	61	Keibiskow..................	90·50· 5·0	2	0·0	

Heerenlogement's Berg { Dollond centered over the angle point $a = 4{\cdot}0$ feet.

1843. May 25		D	62	Ceder Berg..	89·17· 3·2	12	0·0	— 3·6
25		D	63	Piket Berg.....	90·12·51·8	10	„	— 3·6
26	$11\frac{1}{2}$ a.m.	D	64	Bokkeveld Berg...........	90·18·15·6	10	„	— 2·6
26	noon	D	65	Klip Rug.....................	90· 1·38·0	10	„	— 3·0

Kamies Sector Berg { Both Theodolites centered over the angle point, for D $a = 4{\cdot}0$ feet, for B $a = 4{\cdot}3$ feet.

Sept. 19	$11\frac{1}{2}$ a.m.	D	66	Ezels Kop (2 ft. from top)	88·59·31·4	6	-2·0	—61·8
16	2 p.m.	D	67	Louis Fontein...............	91· 2·23·6	8	0·0	— 3·3
19	$0\frac{1}{2}$ p.m.	D		„	3· 9·3	6	„	„
19	4 p.m.	D	68	Bokkeveld Berg...........	90·48·16·6	2	0·0	— 2·1
1847. Mar. 21	$6\frac{3}{4}$ a.m.	B	69	Vogel Klip...............H	90·29· 2·0	2	2·5	— 1·6
Sept. 6	8 a.m. to 4 p.m.	B			28·21·0	9	„	— 1·6

Kamies Sector Berg—(*continued*).

1847. Sept. 6	8 a.m. to 4 p.m.	B	70	Koe Berg.....................	90·34·51·5	9	0·0	— 3·5
6	8 a.m. to 4 p.m.	B	71	North End................H	90·37·54·0	9	2·5	— 1·4
6	4 p.m.	B	72	Boschluis ....H	90·43·37·5	5	2·5	— 1·3
Mar. 21	$7\frac{1}{2}$ p.m.	B	73	Keibiskow (*a*).............	90·33·42·5	1	0·0	— 2·1
21	10 a.m.	B	74	Roode Wal................H	91·23·55·0	1	2·5	— 1·6

Roode Wal { Theodolite centered over the angle point, $a = + 4{\cdot}3$ feet.

Mar. 5	$6\frac{1}{2}$ a.m.	B	75	Kamies Sector Berg....H	89· 6·50·0	3	2·5	— 1·6
5	$6\frac{1}{2}$ a.m.	B	76	Ezels Kop..................H	88·53· 5·0	3	2·5	— 1·8
5	$6\frac{1}{2}$ a.m.	B	77	Vogel Klip..................	89·38·30·0	2	0·0	— 2·8
5	$6\frac{1}{2}$ a.m.	B	78	Louis Fontein (*a*).........	89·53·45·0	3	0·0	— 3·7

Koe Berg { Theodolite centered over the angle point, $a = 4{\cdot}3$ feet.

May 10	$8\frac{1}{2}$ a.m.	B	79	Kamies Sector Berg....H	90· 0· 2·5	2	2·5	— 1·4
10	$8\frac{1}{2}$ a.m.	B	80	Vogel Klip...............H	90· 6· 2·5	2	2·5	— 1·9
10	$8\frac{1}{2}$ a.m.	B	81	Ezel's Kop................H	89·56·52·5	2	0·0	— 3·4

Ezel's Kop { Theodolite centered over the angle point, $a = 4{\cdot}3$ feet.

Mar. 29	7 a.m.	B	82	Vogel Klip...............H	90·33·40·0	1	2·5	— 1·6
29	4 p.m.	B	83	Louis Fontein...........H	91· 9·15·0	1	2·5	— 1·6
29	4 p.m.	B	84	Roode Wal...............H	91·34·45·0	1	2·5	— 1·8

North End Sector Station { Theodolite centered over the angle point, $a = 4{\cdot}3$ feet.

June 8&9	a.m.&p m.	B	85	Kamies Sector Berg....H	89·57·47·0	8	2·5	— 1·4
„	„	B	86	Ezels Kop....................	89·55·12·0	9	0·0	— 3·2
„	„	B	87	Vogel Klip..................	90· 4·50·6	9	0·0	— 4·0

(*a*) Mirage.

§ 9.

OBSERVED ZENITH DISTANCES OF STATIONS—(*continued*).

Royal Observatory { For Dollond repeating circle, $a = +\overset{\text{ft.}}{9}$, $d = \overset{\text{ft.}}{25{\cdot}5}$. For Transit circle $a = -13$ feet.

DATE.	HOUR.	Instrument employed.	No. for Reference.	STATION OBSERVED.	OBSERVED ZEN. DIST.	No. of Observations.	Height of Object observed above the Surface.	Correction to Z.D.
1860.	h				° ′ ″		ft	″
Feb. 27	3¾ p.m.	D	88	Sneeuwkop.................. ($\gamma = 237°{\cdot}39'$).	88·19· 8·0	10	0·0	−12·2
28	10⅓ a.m.	D			19·16·0	8	,,	,,
27	4¾ p.m.	D	89	Kogel Berg.................. ($\gamma = 265°\ 14'$).	88·46· 4·0	8	0·0	−11·4
28	10¾ p.m.				46·10·5	4	,,	,,
27	4¼ p.m.	D	90	Zwart Kop.................. ($\gamma = 317°{\cdot}33'$).	89· 3·51·0	4	0·0	−16·8
28	11 a.m.	D	91	Tyger Berg.................. ($\gamma = 183°{\cdot}2'$).	88·23·40·0	6	0·0	−44·8
28	3½ p.m.				23·31·0	4	,,	,,
Mar. 1	4 p.m.				23·22·0	2	,,	,,
1	4½ p.m.				23·40·0	2	,,	,,
Feb. 28	3⅓ p.m.	D	92	King's Battery.............. ($\gamma = 12°{\cdot}26'$).	82·12·17·0	4	0·0	−114·6
28	3¾ p.m.				12·31·0	4	,,	,,
29	4⅓ p.m.				12· 9·0	4	,,	,,
Mar. 1	3¾ p.m.				12·32·0	2	,,	,,
1	4¼ p.m.				12·19·5	2	,,	,,
Feb. 29	10¾ a.m.	D	93	Muizen Berg................ ($\gamma = 319°{\cdot}12'$).	88·34· 3·0	4	0·0	−28·9
Mar. 1	4 p.m.				33·56·0	2	,,	,,
1	4¼ p.m.				34· 7·0	2	,,	,,
Feb. 29	11 a.m.	D	94	Simon's Berg................ ($\gamma = 213°{\cdot}1'$).	88·53·42·0	4	0·0	−14·5
29	4½ p.m.				53·52·0	4	,,	,,
Mar. 1	3¼ p.m.				53·48·0	4	,,	,,
1	3½ p.m.				53 39·0	2	,,	,,
Feb. 29	3¾ p.m.	D	95	Lion's Rump................ ($\gamma = 53°{\cdot}45'$).	87·20·30·0	4	0·0	−73·6
Feb. 29	4 p.m.	D	96	Lion's Head..................	85·28·54·0	4	,,	
Mar. 1	3 p.m.	D	97	Hanglip, knob.......... ... ($\gamma = 280°{\cdot}2'$).	89·48·28·0	4	0·0	− 9·8
1	3½ p.m.				48· 5·0	2	,,	,,
Mar. 1		TC	98	Meridian Mark.....	89·45· 8·0	3	0·0	+39·2

King's Battery { Beaufort Theodolite centered over the angle point, $a = +4{\cdot}3$ feet.

DATE.	HOUR.	Instrument employed.	No. for Reference.	STATION OBSERVED.	OBSERVED ZEN. DIST.	No. of Observations.	Height of Object observed above the Surface.	Correction to Z.D.
1846.					° ′ ″		ft	″
Aug. 9	2 p.m.	B	99	Zwart Kop..................	89·46·45·0	1	0·0	− 8·8
9	,,	B	100	Cape Point..................	90·28· 0·0	1	,,	− 6·0
9	,,	B	101	Cape Hanglip..............	90·13·15·0	1	,,	− 4·7
9	,,	B	102	Kogel Berg..................	89·15·15·0	1	,,	− 5·3
9	,,	B	103	Sneeuwkop..................	88·52·10·0	1	,,	− 5·4
9	,,	B	104	Simon's Berg................	89·31·20·0[a]	1	,,	− 6·2
9	,,	B	105	Tyger Berg..................	90· 7·40·0	1	,,	−16·3
9	,,	B	106	Meridian Mark............	90·50·55·0	1	,,	−11·9
9	,,	B	107	Royal Observatory, lantern ball..................	97·44·55·0	1	19·0	+359·8
9	,,	B	108	Kapoc Berg..................	90·12·15·0	1	0·0	− 4·6

Tyger Berg { Beaufort Theodolite centered over the angle point, $a = +4{\cdot}3$ feet.

DATE.	HOUR.	Instrument employed.	No. for Reference.	STATION OBSERVED.	OBSERVED ZEN. DIST.	No. of Observations.	Height of Object observed above the Surface.	Correction to Z.D.
Oct. 9	10½ a.m.	B	109	Sneeuwkop..................	88·33 55·0	1	0·0	− 6·5
9	,,	B	110	Kogel Berg	89·13·40·0	1	,,	− 5·4
9	,,	B	111	Cape Hanglip..............	90·11·55·0	1	,,	
9	,,	B	112	Cape Point, Owen's pile..	90·23·10·0	1	,,	
9	,,	B	113	Zwart Kop..................	89·53·20·0	1	,,	− 6·3
9	,,	B	114	Table Mountain, top of pile........................	88· 7·30·0	1	16·0	+37·5
9	,,	B	115	King's Battery............	90· 1· 0·0	1	0·0	−16·3
9	,,	B	116	Royal Observatory, lantern ball..................	91·43· 0·0	1	19·0	+65·5
9	11½ a.m.	B	117	Meridian Mark............	91· 6·55·0	1	0·0	−17·2

Zwart Kop { Beaufort Theodolite centered over the angle point, $a = +4{\cdot}3$ feet.

DATE.	HOUR.	Instrument employed.	No. for Reference.	STATION OBSERVED.	OBSERVED ZEN. DIST.	No. of Observations.	Height of Object observed above the Surface.	Correction to Z.D.
1845.								
June 3		B	118	Royal Observatory......H	91·10·40·0		2·5	− 3·5
3		B	119	Sneeuwkop ....H	89· 9·20·0		2·5	− 4·3

[a] An error of 15′ assumed in the Z.D.

Zwart Kop—(*continued*).

1845.								
June 3		B	120	Table Mountain, pile.....	89·10·45·0		0·0	— 9·4
3		B	121	King's Battery...........H	90·26·30·0		0·0	— 3·7
3		B	122	Kogel Berg..................	89·12·30·0		0·0	— 6·8
June 7	8¼ a.m.	B	123	Hanglip, knob...............	90·23· 0·0		0·0	— 7·2
7	”	B	124	Muizenberg............. ...	90·30·30·0		0·0	—19 4

Cape Point { Beaufort Theodolite centered over the angle point, $a = +4·3$ feet.

Mar. 15		B	125	Sneeuwkop..................	88·50·30·0		0·0	— 4·7
15		B	126	Meridian Mark........... .	90·19·30·0		0·0	— 4·0
15		B	127	King's Battery.............	89·53·20·0		0·0	— 6·0
15		B	128	Tyger Berg..................	90· 0· 0·0		0·0	— 4·8
15		B	129	Table Mountain, pile......	88·59·40·0		0·0	— 6·3
15		B	130	Kogel Berg..................	88·35·20·0		0·0	— 6·9

Danger Point { Beaufort Theodolite centered over the angle point, $a = +4·3$ feet.

Aug. 15	8½ a.m.	B	131	Zonder-Einde Berg.....H	89·14·30·0		2·5	— 1·6
22	1 p.m.			”	14·45·0		0·0	— 3·7
15	8½ a.m.		132	Cape L'Agulhas.........H	90·25·50 0[a]		2·5	— 1·8
22	0¾ p.m.			”	90·26· 0·0[b]		2·5	— 1·8
22	0¼ p.m.		133	Babels Toren	88·35·45·0		0·0	— 8 8
22	1 p.m.		134	Zwart Berg, Caledon......	89·14·20·0		0·0	— 5·9
22	1 p.m.		135	Gunners Quoin............	90·11· 0·0		0·0	— 9·8
22	0½ p.m.		136	Hanglip, knob	90· 6· 0·0		0·0	
22	0½ p.m.		137	Zwart Kop..................	90·10· 0·0		0·0	— 2·9
22			138	Kogel Berg..................	89·20·50·0		0·0	— 4·5
22	1⅓ p.m.		139	Mudge Point................	89·51·50·0		0·0	— 9·0
22	1⅓ p.m.		140	Sneeuwkop..................	89·15·50·0		0·0	— 3·8

Babel's Toren { Beaufort Theodolite centered over the angle point, $a = +4·3$ feet.

1845.								
Sept. 11	a.m.&p.m.	B	141	Zonder-Einde Berg.....H	89·46· 1·7		2·5	— 2·0
11	a.m.		142	Gunner's Quoin.........H	91· 7·55·0		2·5	— 2·1
11	0⅛ p.m.		143	Danger Point...............	91·39·25·0		0·0	— 8·8
11	3¾ p.m.		144	Sneeuwkop..................	89·37·35·0		0·0	— 6·3
14	noon.			”	37·25·0		0·0	”
14	1¾ p.m.			”	37·35·0		0·0	”
14	2¾ p.m.		145	Zwart Berg, Caledon......	90·17·45 0		0·0	—11·3
14	10 a.m.		146	Mudge Point................	92·37·40·0		0·0	—17·5
14	a.m.&p.m.		147	Kogel Berg..................	90· 1·32·5		0·0	— 7·0
14	1¾ p.m.		148	Table Mountain, pile.....	90·24·25·0		0·0	”

Cape L'Agulhas { Beaufort Theodolite centered over the angle point, $a = +4·3$ feet.

1845.								
Aug. 8	9 a.m.	B	149	Pot Berg......................	89·54·20·0	1	0·0	— 3·8
8	9 a.m.	B	150	Danger Point...............	90· 3·35·0	1	0·0	— 4·3

East End of Cape Town Parade, Base Line, *see* *p.* 439. { Dollond centered over the angle point, $a = 3·93$ feet.

1842.								
Aug. 25	11½ a.m.	D	151	Table Mountain, rock....	76·11 47·9	40	0·0	—53·5

West End of Cape Town Parade, Base Line, *see* *p.* 439. { Dollond centered over the angle point, $a = 3·93$ feet.

1842.								
Aug. 25	3½ p.m.	D	152	Table Mountain, rock....	76·43·33·9	40	0·0	—51·7

[a] The observed Z.D. increased 3′.
[b] Bad.

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The following formulæ have been employed in the calculation of the co-efficient of refraction, and the altitudes of the points observed :

Let h and h' be the heights of the two stations above the surface of the sphere.
z and z' the reciprocal zenith distances.
s the distance of the projections of the two stations on the sphere.
c the angle subtended by s at the center of the earth.
m the co-efficient of refraction.
ν the mean of the normals at the two points.

then $h'-h = s \cot. (z + m c - \frac{1}{2} c) \left(1 + \frac{h'+h}{2\nu}\right)$.

and $m = \frac{1}{2}\left(1 - \frac{z + z' - 180^\circ}{c}\right)$.

The calculation of m from 10 sets of reciprocal zenith distances is contained in the following table :

Reference number in preceding Abstract.	STATION.	TRUE ZENITH DIST.	No. of Observations.	LOG. DISTANCE.	$z+z'$ -180°.	c	Co-efficient of refraction, m.
		° ′ ″			″	″	
4	East End of Base..........	89· 8·29·1	68	4·87949	646·1	746·2	·0671
19	Kapoc Berg..................	91· 2·17·0	82				
9	East End of Base..........	88·37· 3·2	84	5·03398	923·0	1065·0	·0667
29	Riebeek's Kasteel.........	91·38·19·8	48				
20	Kapoc Berg..................	89·29· 5·1	66	5·13281	1156·7	1337·1	·0675
27	Riebeek's Kasteel.........	90·50·11·6	44				
7	East End of Base..........	89·11· 6·7	44	4·91958	700·3	818·3	·0721
38	Zwart Berg..................	91· 0·33·6	48				
39	Zwart Berg..................	90·12·41·8	48	5·19857	1333·9	1555·7	·0713
22	Kapoc Berg..................	90· 9·32·1	86				
40	Zwart Berg..................	89·23·26·9	52	5·06897	992·6	1154·3	·0700
28	Riebeek's Kasteel.........	90·53· 5·7	20				
32	Riebeek's Kasteel.........	90·21·30·4	38	5·40374	2154·0	2495·1	·0684
46	Piket Berg	90·14·23·6	32				
49	Eland's Berg...............	89·18· 0·4	8	5·16749	1204·5	1448·3	·0842
47	Piket Berg..................	91· 2· 4·1	48				
50	Eland's Berg...............	88·53·27·2	8	5·12895	1118·6	1325·3	·0780
52	Lambert's Hoek Berg....	91·25·11·4	12				
57	Ceder Berg.....	91·15·33·4	21	5·35982	1953·0	2255·2	·0670
62	Heerenlogement's Berg...	89·16·59·6	12				

The mean value of m from the above is ·0712.

Adopting this value of m, and putting

$$h'-h = s \cot. (z - f.s) \left(1 + \frac{h+h'}{2\nu}\right).$$

we have $f = \frac{0·4288}{\nu \sin. 1''}$.

The following table gives the log. of f, the argument being the mean lat. of the two points :

Lat. 30°......Log. f = 7·62567
31 ....7·62565
32 ....7·62563
33 ....7·62561
34 ....7·62558
35 ....7·62556.

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The weight of each separate result is assumed to be directly proportional to the number of observations, and inversely as the distance of the stations.

Reference number in the Abstract.	STATION.	POINT OBSERVED.	TRUE ZEN. DISTANCE z.	No. of Observations.	LOG. DISTANCE (s).	$f.s.$	$z-f.s.$	$h'-h.$	Weight.
			° ′ ″			′ ″	° ′ ″	feet	
1	West End of Base.........	East End of Base..........	89·59·50·3	44	4·63164	3· 0·8	89·56·49·5	39·5	150
2		Kapoc Berg..................	88·42·22·5	64	4·73692	3·50·4	88·38·32·0	1293·0	160
3		Klip Fontein, Contre Berg	89·42· 7·1	30	4·77802	4·13·3	89·37·54·0	386·0	70
4	East End of Base..........	Kapoc Berg..................	89· 8·29·1	68	4·87949	5·20·0	89· 3· 9·0	1253·0	130
5		Groote Zwart Berg.......	89·38·55·6	32	4·94425	6·11·4	89·32·44·0	698·0	50
6		Contre Berg Rock.........	89· 9·12·0	28	4·90078	5·36·0	89· 3·36·0	1306·0	50
7		Zwart Berg..................	89·11· 6·7	44	4·91958	5·50·9	89· 5·16·0	1323·0	75
8		Baviaan's Berg.............	89· 9·16·0	24	4·98209	6·45·2	89· 2·31·0	1605·0	35
9		Riebeek's Kasteel..........	88 37· 3·2	84	5·03398	7·36·6	88·29·27·0	2849·0	110
10		Winter Berg................	88·21·28·6	28	5·30190	14·6·3	88· 7·22·0	6569·0	20
11		Drie Fontein................	89·38·34·4	36	4·89061	5·28·3	89·33· 6·0	608·0	65
12		West End of Base.........	90· 6·30·5	38	4·63164	3· 0·8	90· 3·30·0	− 43·6	130
13		Klip Fontein, Contre Berg	89·46·52·5	40	4·81788	4·37·6	89·42·15·0	339·5	85
14	Klip Fontein, Contre Berg	West End of Base.........	90·26·53·0	28	4·77802	4·13·2	90·22·40·0	− 395·5	65
15		Riebeek's Kasteel..........	88·50·24·4	24	5·04733	7·50·9	88·42·33·5	2513·0	30
16		Drie Fontein................	89·52·38·9	40	4·87962	5·20·0	89·47·19·0	279·6	75
17		Zwart Berg	86·46·45·9	26	5·15760	10· 7·0	89·36·39·0	976·0	25
18		East End of Base..........	90·22·30·1	24	4·81788	4·37·6	90·17·52·5	− 342·0	50
19	Kapoc Berg.................	East End of Base..........	91· 2·17·0	82	4·87949	5·20·0	90·56·57·0	−1255·0	150
20		Riebeek's Kasteel..........	89·29· 5·1	66	5·13281	9·33·3	89·19·32·0	1598·0	70
21		Klip Fontein, Sector Stat.	90·33·21·7	58	5·42032	18·31·5	90·14·50·0	−1136·0	30
22		Zwart Berg..................	90· 9·32·1	77	5·19857	11· 7·1	89·58·25·0	73·0	75
23		Winter Berg................	89· 6·14·4	18	5·40740	17·58·9	88·48·15·5	5334·0	10
24		Patrys Berg.................	90·25·27·6	20	5·37319	16·37·2	90· 8·50·0	− 607·0	10
25		Kapitein's Kloof...........	89·53·28·6	4	5·41717	18·23·5	89·35· 5·0	1894·0	2
26		Sneeuw Kop.	89·36·11·9	5	5·45786	20·11·9	89·16· 0·0	3673·0	2
27	Riebeek's Kasteel.........	Kapoc Berg..................	90·50·11·6	44	5·13281	9·33·3	90·40·38·0	−1605·0	45
28		Zwart Berg..................	90·53· 5·7	20	5·06897	8·15·0	90·44·51·0	−1529·0	25
29		East End of Base..........	91·38·19·8	48	5·03398	7·36·6	91·30·43·0	−2854·0	60
30		Royal Observatory.........	91· 0·48·8	20	5·37893	16·50·5	90·43·58·0	−3061·0	10
31		Klip Fontein, Granary...	90·54·21·5	20	5·41573	18·19·8	90·36· 2·0	−2730·0	10
32		Piket Berg..................	90·21·30·4	38	5·40374	17·49·9	90· 3·40·5	− 271·0	20
33		Winter Berg................	88·31· 4·0	20	5·11349	9· 8·4	88·21·56·0	3706·5	20
34		Rogge Bay..................	91· 0·14·7	32	5·38576	17· 6·5	90·43· 8·0	−3050·0	20
35		Baviaan's Berg Rock......	90·46·37·1	12	5·04757	7·51·2	90·38·46·0	−1258·0	15
36		Contre Berg Rock.........	90·53· 3·6	12	5·06470	8·10·1	90·44·53·5	−1516·0	15
37	Zwart Berg..................	Drie Fontein................	90·29·16·1	32	5·04284	7·46·1	90·21·30·0	− 690·0	40
38		East End of Base..........	91· 0·33·6	48	4·91958	5·50·9	90·54·43·0	−1323·0	80
39		Kapoc Berg..................	90·12·41·8	48	5·19857	11· 7·1	90· 1·35·0	− 73·0	40
40		Riebeek's Kasteel..........	89·23·26·9	52	5·06897	8·15·0	89·15·12·0	1527·5	60
41	Klip Fontein, Sect. Stat.	Patrys Berg.................	89·58·32·9	36	5·15390	10· 1·9	89·48·31·0	476·0	40
42		Zwart Berg..................	89·41·33·6	12	5·15613	10· 5·0	89·31·29·5	1188·0	10
43	Piket Berg..................	Patrys Berg.	90·53· 1·9	48	5·21137	11·27·0	90·41·35·0	−1968·0	40
44		Zwart Berg..................	90·41·50·7	20	5·13542	9·36·8	90·32·14·0	−1281·0	20
45		Kapoc Berg..................	93·36· 1·0	28	5·42661	18·47·8	90·17·13·0	−1337·5	15
46		Riebeek's Kasteel	90·14·23·6	32	5·40374	17·49·9	89·56·34·0	253·0	20
47		Eland's Berg...............	91· 2· 4·0	48	5·16749	10·21·0	90·51·43·0	−2212·0	50
48	Eland's Berg...............	Heerenlogement's Berg...	89·30· 5·1	12	5·17282	10·28·7	89·19·36·0	1750·0	10
49		Piket Berg..................	89·18· 0·4	8	5·16749	10·21·0	89· 7·39·0	2240·0	10
50		Lambert's Hoek Berg....	88·53·27·2	8	5·12895	9·28·3	88·43·59·0	2976·0	10

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Reference number in the Abstract.	STATION.	POINT OBSERVED.	TRUE ZEN. DISTANCE z.	No. of Observations.	LOG. DISTANCE (s).	$f.s.$	$z-f.s.$	$h'-h.$	Weight.
			° ′ ″			′ ″	° ′ ″	feet	
51	Lambert's Hoek Berg....	Heerenlogement's Berg...	90·39·45·1	12	5·14445	9·48·9	90·29·56·0	−1214·0	10
52		Eland's Berg...............	91·25·11·4	12	5·12895	9·28·3	91·15·43·0	−2964·0	10
53		Piket Berg..................	91·27·52·0	12	5·19683	11· 4·4	90·16·48·0	− 769·0	10
54		Klip Rug, kop.............	90·17·30·3	12	5·49786	22· 8·9	89·55·21·0	426·0	5
55	Ceder Berg..................	Lambert's Hoek Berg....	91·27·44·0	12	5·07375	8·20·5	91·19·23·5	−2737·0	15
56		Piket Berg..................	91· 9· 7·9	23	5·35444	15·55·1	90·53·13·0	−3501·0	15
57		Heerenlogement's Berg..	91.15·33·4	21	5·35982	16· 7·0	90·59·26·0	−3959·0	15
58		Winter Berg................	90·14·46·6	9	5·43709	19·15·3	89·55·31·0	357·0	5
59		Kapitein's Kloof...........	91· 0·31·0	11	5·35073	15·47·0	90·44·44·0	−2918·0	7
60		Klip Rug.....................	90·51·23·6	11	5·43396	19· 7·0	90·32·17·0	−2551·0	5
62	Heerenlogement's Berg...	Ceder Berg..................	89·16·59·6	12	5·35982	16· 7·0	89· 0·53·0	3938·0	7
63		Piket Berg..................	90·12·48·2	10	5·42183	18·35·7	89·54·12·5	445·0	5
64		Bokkeveld Berg............	90·18·13·0	10	5·50905	22·43·6	89·55·29·0	424·0	4
65		Klip Rug.....................	90· 1·35·0	10	5·44340	19·32·3	89·42· 3·0	1449·0	5
66	Kamies Sector Berg......	Ezels Kop....................	88·58·29·6	6	4·30150	1·24·6	88·57· 5·0	366·5	40
67		Louis Fontein...............	91· 2·50·8	14	5·39510	17·29·0	90·45·22·0	−3278·0	8
68		Bokkeveld Berg............	90·48·14·5	2	5·58619	27· 8·8	90·21· 6·0	−2367·0	1
69		Vogel Klip..................	90·28·33·1	11	5·36346	16·15·3	90·12·18·0	− 826·0	7
70		Koe Berg.....................	90·34·48·0	9	5·40039	17·41·8	90·17· 6·0	−1251·0	5
71		North End...................	90·37·52·6	9	5·41710	18·23·5	90·19·29·0	−1481·0	4
72		Boschluis....................	90·43·36·2	5	5·47671	21· 5·8	90·22·30·0	−1962·0	2
73		Keibiskow....................	90·33·40·4	1	5·62329	29·34·0	90· 4· 6·0	− 501·0	1
74		Roode Wal...................	91·23·53·4	1	5·35426	15·54·8	91· 7·59·0	−4471·0	1
75	Roode Wal................	Kamies Sector Berg.......	89· 6·48·4	3	5·35426	15·54·8	88·50·54·0	4545·0	2
76		Ezels Kop....................	88·53· 3·2	3	5·31479	14·31·9	88·38·31·0	4894·0	2
77		Vogel Klip..................	89·38·27·2	2	5·49343	21·55·5	89·16·32·0	3938·0	1
78		Louis Fontein..............	89·53·41·3	3	5·38228	16·58·5	89 36·43·0	1633·0	2
79	Koeberg......................	Kamies Sector Berg.......	90· 0· 1·1	2	5·40039	17·41·8	89·42·19·0	1293·0	1
80		Vogel Klip..................	90· 6· 0·6	2	5·29688	13·56·7	89·52· 4·0	457·0	1
81		Ezel's Kop..................	89·56·49·1	2	5·41995	18·30·8	89·38·18·0	1660·0	1
82	Ezel's Kop	Vogel Klip..................	90·33·38·4	1	5·35534	15·57·2	90·17·41·0	−1166·0	1
83		Louis Fontein..............	91· 9·13·4	1	5·38523	17· 5·4	90·52· 8·0	−3682·0	1
84		Roode Wal..................	91·34·43·2	1	5·31479	14·31·9	91·20·11·0	−4816·0	1
85	North End........	Kamies Sector Berg......	89·57·45·6	8	5·41710	18·23·5	89·39·22·0	1568·0	4
86		Ezels Kop....................	89·55· 8·8	9	5·43814	19·18·3	89·35·50·5	1927·0	5
87		Vogel Klip..................	90· 4·46·6	9	5·34853	15·42·3	89·49· 4·0	710·0	6
88	Royal Observatory........	Sneeuwkop..................	88·18·59·8	18	5·19913	11· 7·9	88· 7·52·0	5161·0	16
89		Kogel Berg..................	88·45·55·9	12	5·21646	11·35·1	88·34·21·0	4102·0	10
90		Zwart Kop..................	89· 3·34·2	4	5·02695	7·29·3	88·56· 5·0	1979·0	5
91		Tyger Berg..................	88·22·48·4	14	4·65074	3· 8·9	88·19·39·5	1306·0	45
92		King's Battery.............	82·10·27·1	16	3·99477	0·41·7	82· 9·45·0	1360·0	230
93		Muizen Berg................	88·33·33·1	8	4·78272	4·16·0	88·29·17·0	1600·0	20
94		Simon's Berg...............	88·53·30·8	14	5·12418	9·22·0	88·44· 9·0	2937·0	15
95		Lion's Rump................	87·19·16·4	4	4·36538	1·37·9	87·17·38·5	1096·0	25
97		Cape Hanglip, knob......	89·48· 6·7	6	5·27743	13·19·8	89·34·47·0	1389·0	5
98		Meridian Mark.....	89·45·47·2		4·83515	4·48·9	89·40·58·0	379·0	
99	King's Battery.............	Zwart Kop..................	89·46·36·2	1	5·00158	7· 3·8	89·39·32·0	597·5	1·5
100		Cape Point..................	90·27·54·0	1	5·16613	10·19·0	90·17·35·0	− 750·0	1
101		Cape Hanglip...............	90·13·10·3	1	5·27715	13·19·3	89·59·51·0	8·0	1
102		Kogel Berg..................	89·15· 9·7	1	5·22282	11·45·3	89· 3·24·0	2750·0	1
103		Sneeuwkop..................	88·52· 4·6	1	5·21674	11·35·5	88·40·29·0	3811·0	1
104		Simon's Berg...............	89·31·13·8	1	5·15260	10· 0·0	89·21·14·0	1602·5	1
105		Tyger Berg..................	90· 7·23·7	1	4·73720	3·50·6	90· 3·33·0	− 56·4	2·5
106		Meridian Mark..............	90·50·43·1	1	4·87322	5·15·4	90·45·28·0	− 988·0	2
107		Royal Observatory........	97·50·54·8	1	3·99477	0·41·7	97·50·13·0	−1360·0	15
108		Kapoc Berg..................	90·12·10·4	1	5·28837	13·40·3	89·58·30·0	85·0	1

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Reference number in the Abstract.	STATION.	POINT OBSERVED.	TRUE ZEN. DISTANCE z.	No. of Observations.	LOG. DISTANCE (s).	$f.s.$	$z-f.s.$	$h'-h$.	Weight.
			° ′ ″			′ ″	° ′ ″	feet	
109	Tyger Berg.................	Sneeuwkop..................	88·33·48·5	1	5·13736	9·39·3	88·24· 9·0	3826·0	1
110		Kogel Berg	89·13·34·6	1	5·21648	11·35·1	89· 1·59·5	2778·0	1
113		Zwart Kop..................	89·53·13·7	1	5·15051	9·57·2	89 43·16·5	688·0	1
114		Table Mountain, pile......	88· 8· 7·5	1	4·80851	4·31·7	88· 3·36·0	2179·5	2
115		King's Battery.............	90· 0·43·7	1	4·73720	3·50·6	89·56·53·0	49·5	2·5
116		Royal Observatory........	91·44·5 ·5	1	4·65074	3· 8·9	91·41· 3·0	—1314·0	3
117		Meridian Mark.............	91· 6·37·8	1	4·71314	3·38·6	91· 2·59·0	— 947·0	3
118	Zwart Kop..................	Royal Observatory........	91·10·36·5	1	5·02695	7·29·3	91· 3· 7·0	—1954·0	1
119		Sneeuwkop.	89· 9·15·7	2	5·24171	12·16·7	88·56·59·0	3198·5	2
120		Table Mountain, pile.....	89·10·35·6	2	4·97692	6·40·4	89· 3·55·0	1547·0	3
121		King's Battery.............	90·26·26·3	1	5·00158	7· 3·8	90·19·22·5	— 566·0	1·5
122		Kogel Berg...................	89·12·23·2	1	5·11529	9·10·6	89· 3·13·0	2154·0	1
123		Cape Hanglip, knob......	90·22·52·8	1	5·09150	8·41·3	90·14·11·5	— 510·0	1
124		Muizenberg..................	90·30·10·6	1	4·66111	3·13·5	90·26·57·0	— 359·0	3
125	Cape Point..................	Sneeuwkop..................	88·50·25·3	1	5·27638	13·17·9	88·37· 7·0	4557·0	1
126		Meridian Mark.............	90·19 26·0	1	5·34327	15·30·8	90· 3·55·0	— 251·0	1·5
127		King's Battery.............	89·53·14·0	1	5·16613	10·19·0	89·42·55·0	728·5	1
128		Tyger Berg..................	89·59·55·2	1	5·26443	12·56·3	89·46·59·0	696·0	1
129		Table Mountain, pile......	88·59·33·7	2	5·15072	9·57·4	88·49·36·0	2898·0	2
130		Kogel Berg..................	88·35·13·1	1	5·10689	9· 0·1	88·26·13·0	3490·0	1
131	Danger Point...............	Zonder-Einde Berg.......	89·14·34·9	2	5·38007	16·53·1	88·57·42·0	4348·0	1
132		Cape L'Agulhas............	90·25·48·2	1	5·31427	14·30·6	90·11·18·0	— 678·0	1
133		Babels Toren	88·35·36·2	1	5·00360	7· 5·8	88·28·30·0	2684·0	1·5
134		Zwart Berg, Caledon......	89·14·14·1	1	5·17672	10·34·3	89· 3·40·0	2462·0	1
135		Gunners Quoin............	90·10·50·2	1	4·95471	6·20·4	90· 4·30·0	— 118·0	1·5
137		Zwart Kop..................	90· 9·57·1	1	5·48977	21·44·2	89·48·13·0	1059·0	0·5
138		Kogel Berg..................	89·20·45·5	1	5·29702	13·56·7	89· 6·49·0	3066·0	1
139		Mudge Point................	89·51·41·0	1	4·99582	6·58·2	89·44·43·0	440·0	1·5
140		Sneeuwkop..................	89·15·46·2	1	5·37097	16·32·1	88·59·14·0	4153·0	0·5
141	Babels Toren..............	Zonder-Einde Berg.......	89·45·59·7	3	5·28989	13·43·1	89·32·17·0	1572·0	2
142		Gunner's Quoin............	91· 7·52·9	1	5·25093	12·32·5	90·55·20·0	—2869·0	1
143		Danger Point...............	91·39·16·2	1	5·00360	7· 5·8	91·32·10·0	—2704·0	1·5
144		Sneeuwkop..................	89·37·25·4	3	5·14684	9·52·1	89·27·33·0	1324·0	3
145		Zwart Berg, Caledon......	90·17·33·7	1	4·89600	5·32·3	90·12· 1·0	— 275·0	2
146		Mudge Point................	92·37·22·5	1	4·70367	3·33·4	92·33·49·0	—2263·0	3
147		Kogel Berg..................	90· 1·25·5	2	5·10302	8·55·3	89·52·30·0	277·0	2
149	Cape L'Agulhas............	Pot Berg.....................	89·54·16·2	1	5·36737	16·23·9	89·37·52·0	1500·0	1
150		Danger Point...............	90· 3·30·7	1	5·31427	14·30·6	89·49· 0·0	660·0	1
151	East End of Cape Town Parade, Base-line.....	Rock on Table Mountain	76·10·54·4	40	4·15496	1· 0·3	76· 9·54·1	3519·0	
152	West End of Cape Town Parade, Base-line......	Rock on Table Mountain	76·42·42·2	40	4·17182	1· 2·7	76·41·39·5	3513·0	

The altitudes above the sea level of the following stations have been obtained by levelling with the spirit-level, as follows :

Zwart Kop..	= 2031	feet
Cape L'Agulhas.	455	„
Cape Point..	688	„
West End of Base.........................	206	„
East End of Base...	250	„
Roode Wal......................	622	„
Royal Observatory (station over transit circle)	51	„

§ 9.

(1). By means of the altitudes of the West End, East End, and Royal Observatory, we may obtain the altitudes of Kapoc Berg, Riebeek's Kasteel, and Zwart Berg, as follows:

Assume the altitude of Kapoc Berg......... $=1502+x$.
Riebeek's Kasteel $=3101+y$.
Zwart Berg......... $=1574+z$.

Then the observations at the several stations furnish the following equations:

					Weights.
From No. 2	x	$+1502-1293-206=0$	or	$x+3=0$	16
4	x	$+1502-1253-250=0$		$x-1=0$	13
7	z	$+1574-1323-250=0$		$z+1=0$	7·5
9	y	$+3101-2849-250=0$		$y+2=0$	11
19	x	$+1502-1255-250=0$		$x-3=0$	15
20	$x-y$	$+1502-3101+1598=0$		$x-y-1=0$	7
22	$x-z$	$+1502-1574+73=0$		$x-z+1=0$	7·5
27	$x-y$	$+1502-3101+1605=0$		$x-y+6=0$	4·5
28	$y-z$	$+3101-1574-1529=0$		$y-z-2=0$	2·5
29	y	$+3101-2854-250=0$		$y-3=0$	6
30	y	$+3101-3061-51=0$		$y-11=0$	1
38	z	$+1574-1323-250=0$		$z+1=0$	8
39	$x-z$	$+1502-1574+73=0$		$x-z+1=0$	4
40	$y-z$	$+3101-1574-1527{\cdot}5=0$		$y-z-0{\cdot}5=0$	6

Solving these by the method of least squares, having regard to the weights, we have the final equations:

$$791{\cdot}5x-69{\cdot}25y-72{\cdot}25z+68{\cdot}8=0$$
$$69{\cdot}25x-269{\cdot}5y+42{\cdot}25z-20{\cdot}0=0$$
$$72{\cdot}25x+42{\cdot}25y-234{\cdot}75z-78{\cdot}5=0.$$

from these there results:

$$x=-0{\cdot}41,\ y=-0{\cdot}17,\ z=-0{\cdot}14.$$

Applying these corrections, we have:

Height of Kapoc Berg........ = 1501·6 feet above the sea level
„ Riebeek's Kasteel = 3100·8 „ „
„ Zwart Berg........ = 1573·9 „ „

(2). In like manner if we assume height of Klip Fontein Sector Station $=(380+x)$, Patrys Berg $=(864+y)$, Piket Berg $=(2837+z)$ we obtain, after reducing, the following system of equations:

			Weights.
From No. 21	x	$+14{\cdot}4=0$	3
31	x	$+9{\cdot}2=0$	1
41	$x-y$	$-8{\cdot}0=0$	4
42	x	$-5{\cdot}9=0$	1
24	y	$-30{\cdot}6=0$	1
43	$y-z$	$-0{\cdot}5=0$	4
32	z	$+7{\cdot}2=0$	2
44	z	$-17{\cdot}9=0$	2
45	z	$-2{\cdot}1=0$	1·5
46	z	$-10{\cdot}8=0$	2

These give

$$27x-16y+4{\cdot}9=0$$
$$-16x+33y-16z+17{\cdot}4=0$$
$$-16y+30{\cdot}25z-10{\cdot}73=0$$

whence we have $x=-0{\cdot}76,\ y=-0{\cdot}97,\ z=-0{\cdot}16$.

Consequently:

Height of Klip Fontein Sector Station = 379·2 feet above the sea level.
„ Patrys Berg..................... = 863·0 „ „
„ Piket Berg..................... = 2836·8 „ „

§ 9.

(3). Assume Eland's Berg = $(625+w)$, Heerenlogement's Berg = $(2382+x)$, Lambert's Hoek Berg = $(3598+y)$, Ceder Berg = $(6337+z)$. Then we have :—

		WEIGHTS.
From No. 47	$w + 0{\cdot}2 = 0$	5
48	$w-x-7{\cdot}0=0$	1
49	$w+28{\cdot}2=0$	1
50	$w-y+3{\cdot}0=0$	1
51	$x-y-2{\cdot}0=0$	1
52	$w-y-9{\cdot}0=0$	1
53	$y-7{\cdot}8=0$	1
55	$y-z-2{\cdot}0=0$	1·5
56	$z-0{\cdot}8=0$	1·5
57	$x-z+4{\cdot}0=0$	1·5
62	$x-z-17{\cdot}0=0$	0·7
63	$x-9{\cdot}8=0$	0·5.

Final equations :

$$
\begin{aligned}
29w - x - 2y + 20{\cdot}2 &= 0\\
-w + 4{\cdot}99x - y - 2{\cdot}74z + 3{\cdot}22 &= 0\\
-2w - x + 6{\cdot}25y - 2{\cdot}25z - 4{\cdot}3 &= 0\\
-2{\cdot}74x - 2{\cdot}25y + 7{\cdot}24z + 2{\cdot}03 &= 0
\end{aligned}
$$

whence, $w = -0{\cdot}74$, $x = -1{\cdot}20$, $y = {\cdot}00$, $z = -{\cdot}74$

so that the height of Eland's Berg............... = 624·3 feet above the sea level.
" " Heerenlogement's Berg. = 2380·8 " "
" " Lambert's Hoek Berg... = 3598 " "
" " Ceder Berg.................. = 6336·3 " "

(4). Putting Vogel Klip = $(4320+v)$, Kamies Berg = $(5144+w)$, Ezel's Kop = $(5512+x)$, Koeberg = $(3887+y)$, North End = $(3610+z)$, we obtain—

		WEIGHTS.
From No. 66	$w-x-1{\cdot}5=0$	40
69	$v-w+2=0$	7
70	$w-y+6=0$	5
79	$w-y-36=0$	1
71	$w-z+53=0$	4
85	$w-z-34=0$	4
74	$w+51=0$	1
75	$w-23=0$	2
76	$x-4=0$	2
84	$x+74=0$	1
77	$v-240=0$	1 not used.
80	$v-y-24=0$	1
81	$x-y-35=0$	1
82	$v-x-26=0$	1
86	$x-z-25=0$	5
87	$v-z=0$	6

whence there results—

$$
\begin{aligned}
87v - 49w - x - y - 36z + 48 &= 0\\
-49v + 1712w - 1600x - 26y - 32z + 2679 &= 0\\
-v - 1600w + 1632x - y - 25z - 2976 &= 0\\
-v - 26w - x + 28y - 55 &= 0\\
-36v - 32w - 25x + 93z + 321 &= 0
\end{aligned}
$$

From these we obtain, $v = -4{\cdot}65$, $w = -2{\cdot}58$, $x = -0{\cdot}81$, $y = -0{\cdot}63$, $z = -6{\cdot}36$

and consequently the height of Vogel Klip............ = 4315·3 feet above the sea level.
" " Kamies-Sector Berg = 5141·4 " "
" " Ezel's Kop............ = 5511·2 " "
" " Koeberg................ = 3886·4 " "
" " North End............ = 3603·6 " "

§ 9.

The heights thus obtained, together with the levelled heights, furnish data for the calculation of the altitudes above the sea level of the other points observed.

The following table gives the separate and mean results for each station.

NAME OF STATION.	Reference number.	Altitude above the sea level.	Weight.	Mean.	REMARKS.
				feet.	
West End of Base........				206	levelled
East End of Base.........				250	levelled
Kapoc Berg.................				1502	page 602
Riebeek's Kasteel.........				3101	„
Zwart Berg				1574	„
Klip Fontein, Contre Bg.	3	592	7	593	
	13	589·5	8·5		
	14	601·5	6·5		
	15	588	3		
	17	598	2·5		
	18	592	5		
Drie Fontein...............	11	858	6·5	870	
	16	873	7·5		
	37	884	4		
Groote Zwart Berg.......	5			948	
Contre Berg Rock.........	6	1556	5	1563	
	36	1585	1·5		
Baviaan's Berg............	8	1855	3·5	1851	
	35	1843	1·5		
Winter Berg...............	10	6819	2	6818	
	23	6836	1		
	33	6807	2		
Klip Fontein...............				379	page 602
Patrys Berg................				863	„
Piket Berg..................				2837	„
Eland's Berg...............				624	page 603
Lambert's Hoek Berg...				3598	„
Ceder Berg....				6336	„
Heerenlogement's Berg.				2381	„
Kapitein's Kloof..........	25	3396	2	3412	
	59	3418	7		
Klip Rug Station.........	60	3785	5	3807	
	65	3830	5		
Klip Rug, kop.............	54			4024	
Kamies-Sector Berg......				5141	page 603
Ezel's Kop..................				5511	„
Roode Wal.................				622	levelled
Vogel Klip..................				4315	page 603
Koe Berg......				3886	„
North End..................				3604	„
Bokkeveld Berg...........	64	2805	4	2799	
„ „	68	2774	1		
Louis Fontein..............	67	1863	8	1859	*mirage
	78	(2255*)			
	83	1829	1		
Boschluis....................	72			3179	mirage
Keibiskow	73			4640	
Royal Observatory.......				51	levelled
Zwart Kop...................				2031	„
Cape Point..................				688	„

NAME OF STATION.	Reference number.	Altitude above the sea level.	Weight.	Mean	REMARKS.
				feet.	
King's Battery............	92	1411	230	1411	
	107	1411	15		
	99	1433·5	1·5		
	100	1438	1		
	108	1417	1		
Tyger Berg................	113	1343	1	1357	
	115	1361·5	2·5		
	116	1365	3		
	91	1357	45		
	105	1354·6	2·5		
Sneeuwkop.................	88	5212	16	5211	
	109	5183	1		
	103	5222	1		
Kogel Berg..................	89	4153	10	4152	
	110	4135	1		
	102	4161	1		
Simon's Berg...............	94	2988	15	2990	
	104	3013·5	1		
Meridian Mark...........	98	430		430	
	117	410			
	106	423			
Table Mountain, pile....	114	3536·5	2	3549	
	120	3545	3		see below
	129	3566	2		see below
Lion's Rump..............	95			1147	
Muizenberg................	93	1651	20	1650	
	124	1639	3		see below
Hanglip, knob	97	1440	5	1448	
	123	1488	1		see below
Danger Point..............	140	1058	0·5	1126	
	150	1115	1		
	132	1133	1		
	138	1086	1		
	137	(972)	0·5		
	143	1177	1·5		
Mudge Point..............	139	1566	1·5	1600	
	146	1618	3		
Gunner's Quoin	135	1008	1·5	1010	
	142	1012	1		
Zwart Berg, Caledon....	134	3588	1	3600	
	145	3606	2		
Zonder Einde Berg......	131	5474	1	5460	
	141	5453	2		
Babel's Toren.............	133			3810	
Cape L'Agulhas...........				455	levelled
Pot Berg.....................	149			1955	

At the Zwart Kop, Cape Point, and Babels Toren Stations an assumed zenith point was employed in the calculation of the observations made at those localities; the resulting heights of the points observed are therefore relative only.

At Zwart Kop, by comparing the known and computed heights of the Observatory, Sneeuwkop, Kogel Berg, and King's Battery Stations, the mean error of the computed heights is found to be + 33 feet. Hence we have, height of Table Mountain = 3545, Hanglip, knob = 1488, and of Muizenberg = 1639 feet.

In like manner at Cape Point the mean error of the computed heights of Sneeuwkop, Meridian Mark, King's Battery, Tyger Berg, and Kogel Berg = + 20 feet, consequently the height of Table Mountain = 3566.

At Babels Toren the absolute heights are obtained by referring the computed values to the known points Sneeuwkop and Kogel Berg.

SECTION X.

DETERMINATION

OF THE

AZIMUTH OF THE MERIDIAN DISC AT KAMIES-SECTOR BERG,

AND

COMPARISON OF THE ASTRONOMICAL AND GEODETICAL AZIMUTHS OF LOUIS FONTEIN.

The following observations were made with a 30-inch transit instrument by Jones, placed upon a block of granite, and at a distance of 26 feet 3 inches to the south of the "azimuth point,"—as described at page 468.

The disc, which is 14 inches in diameter, is to the south of the station; and its distance from the west rock was found to be 40799·1 feet, by means of a small triangulation effected with Dollond's repeating circle, and derived from a base of 4200 feet measured with the 100 feet steel chain.

Hence the distance of the disc from the transit instrument is 40866 feet, and the angle subtended by it at the latter point is $5''\cdot 88$.

The observations consist of consecutive transits of five circumpolar stars above and below the pole; the central wire of the transit instrument being made either to bisect the disc, or its deviation to the true east or west of the center, estimated in terms of the diameter of the disc.

In the following table, the 4th column contains the observed time of transit of the star corrected for errors of collimation and level, and reduced to the central wire of the system.

The 5th column gives the deviations of the central wire to the true east or west of the center of the disc; and column 6 the corresponding corrections to be applied to the times of transit, in order to reduce them to the vertical plane passing through that point. These corrections are obtained by multiplying the numbers in column 5 by the following factors respectively,—

α Trianguli,	0·672	β Trianguli,	0·465	γ Apodis,	1·472
α Trianguli, S.P.,	1·069	β Trianguli, S.P.,	0·861	γ Apodis, S.P.,	1·868
β Apodis,	1 289	β Argûs,	0·687.		
β Apodis, S.P.,	1·685	β Argûs, S.P.,	1·084.		

§ 10.

Determination of the Azimuth of the Meridian Disc at Kamies-Sector Berg.

Date, 1843.	Illuminated Pivot East or West.	Star.	Observed transit corrected for collimation and level, and reduced to middle wire.	Middle wire east or west of center of disc, in terms of diameter of disc.	Correction to transit.	Seconds of transit corrected.	Upper transit minus lower transit.	Sum.	Divisor.	Error in Azimuth of the Disc.
			h m s		s	s	s	s		′
Aug. 27	West	α Trianguli, S.P...	4·33· 8·72	West 0·50	+0·53	9·25				
28	,,	α Trianguli........	16·33·12·40			12·40	+3·15	+1·83	0·591	+3·10
,,	East	α Trianguli, S.P...	4·33·13·97	East 0·23	−0·25	13·72	−1·32	0·47	,,	0·79
29	,,	α Trianguli........	16·33·15·51			15·51	+1·79	0·30	,,	0·51
,,	West	α Trianguli, S.P...	4·33·16·81	West 0·18	+0·19	17·00	−1·49	0·82	,,	1·39
30	,,	α Trianguli........	16·33·19·31			19·31	+2·31	0·78	,,	1·32
,,	East	α Trianguli, S.P...	4·33·20·70	West 0·13	+0·14	20·84	−1·53	0·76	,,	1·29
31	,,	α Trianguli........	16·33·23·13			23·13	+2·29	1·06	,,	1·79
,,	West	α Trianguli, S.P...	4·33·24·36			24·36	−1·23			
Sept. 5	East	α Trianguli........	16·33·40·09	West 0·05	−0·03	40·06				
,,	West	α Trianguli, S.P...	4·33·41·21	East 0·10	−0·11	41·10	−1·04	0·70	,,	1·18
6	,,	α Trianguli........	16·33·42·84			42·84	+1·74	0·04	,,	0·07
,,	,,	α Trianguli, S.P...	4·33·44·38	West 0·15	+0·16	44·54	−1·70	0·78	,,	1·32
7	East	α Trianguli........	16·33·46·82	East 0·30	+0·20	47·02	+2·48	1·39	,,	2·35
,,	,,	α Trianguli, S.P...	4·33·48·11			48·11	−1·09	1·88	,,	3·18
8	,,	α Trianguli........	16·33·51·08			51·08	+2·97	2·29	,,	3·87
,,	,,	α Trianguli, S.P ..	4·33·51·71	West 0·05	+0·05	51·76	−0·68			
9	West	α Trianguli, S.P...	4·33·55·84	East 0·24	−0·26	55·58				
10	,,	α Trianguli........	16·33·57·59	West 0·25	−0.17	57·42	+1·84	2·02	,,	3·42
,,	,,	α Trianguli, S.P...	4·33·57·24			57·24	+0·18	3·60	,,	6·09
11	,,	α Trianguli........	16·34· 0·66			60·66	+3·42	2·18	,,	3·69
,,	,,	α Trianguli, S.P...	4·34· 1·63	West 0·25	+0·27	61·90	−1·24	2·49	,,	4·21
12	East	α Trianguli........	16·34· 5·63			65·63	+3·73			
13	East	α Trianguli........	16·34· 9·58	West 0·15	−0·10	9·48				
,,	,,	α Trianguli, S.P...	4·34· 9·73	West 0·10	+0 11	9·84	−0·36	2·39	,,	4·04
14	,,	α Trianguli........	16·34·12·59			12·59	+2·75	+1·96	,,	3·32
,,	,,	α Trianguli, S.P...	4·34·13·49	East 0·10	−0·11	13·38	−0·79			
									Mean..	+2·470
Sept. 7	East	β Trianguli........	15·43· 1·45	East 0·28	+0·13	1·58				
,,	,,	β Trianguli, S.P..	3·43· 2·64			2·64	−1·06	+1·41	0·450	+3·13
8	,,	β Trianguli........	15·43 5·11			5·11	+2·47	1·33	,,	2·96
,,	,,	β Trianguli, S.P..	3·43· 6·21	West 0·05	+0·04	6·25	−1·14		,,	
9	West	β Trianguli, S.P..	3·43· 9·93	East 0·24	−0·21	9·72				
10	,,	β Trianguli........	15·43·11·86	West 0·25	−0·12	11·74	+2·02	1·82	,,	4·04
,,	,,	β Trianguli, S.P..	3·43·11.94			11·94	−0·20	2·61	,,	5·80
11	,,	β Trianguli........	15·43·14·75			14·75	+2·81	1·44	,,	3·20
,,	,,	β Trianguli, S.P..	3·43·16·12			16·12	−1·37			
13	East	β Trianguli........	15·43 23·82	West 0·12	−0·06	23·76				
,,	,,	β Trianguli, S.P..	3·43·23·79			23·79	−0·03	3·02	,,	6·71
14	,,	β Trianguli........	15·43·26·96	West 0·25	−0·12	26·84	+3·05	2·10	,,	4·67
,,	,,	β Trianguli, S P..	3·43·27·88	East 0·10	−0·09	27·79	−0·95	+1·87	,,	4·16
15	,,	β Trianguli........	15·43·30·49	,, 0·25	+0·12	30·61	+2·82			
									Mean..	+4·334
Aug. 29	East	γ Apodis............	16·10·46·96			46·96				
,,	West	γ Apodis, S.P......	4·10·48·87	West 0·18	+0·34	49·21	−2·25	−0·25	1·134	−0·22
30	West	γ Apodis............	16·10·51·21			51·21	+2·00	+1·66	,,	+1·46
,,	East	γ Apodis, S.P......	4·10·51·31	West 0·13	+0·24	51·55	−0·34	+2·39	,,	+2·11
31	East	γ Apodis............	16 10·54·28			54·28	+2·73	+1·76	,,	+1·55
,,	West	γ Apodis, S.P......	4·10·55·25			55·25	−0·97			

§ 10.

Determination of the Azimuth of the Meridian Disc at Kamies-Sector Berg—*continued.*

Date, 1843.	Illuminated Pivot East or West.	Star.	Observed transit corrected for collimation and level, and reduced to middle wire.	Middle wire east or west of center of disc, in terms of diameter of disc.	Correction to transit.	Seconds of transit corrected.	Upper transit minus lower transit.	Sum.	Divisor.	Error in Azimuth of the Disc.
			h m s		s	s	s	s		″
Sept. 5	East	γ Apodis…………	16·11·11·90	West 0·05	−0·07	11·83	−0·23			
„	West	γ Apodis, S.P.……	4·11·12·25	East 0·10	−0·19	12·06	+2·10	+1·87	1·134	+1·65
6	„	γ Apodis…………	16·11·14·16			14·16	−1·45	0·65	„	0·57
„	„	γ Apodis, S.P.……	4·11·15·33	West 0·15	+0·28	15·61	+3·30	1·85	„	1·63
7	East	γ Apodis…………	16·11·18·50	East 0·28	+0·41	18·91	+0·13	3·43	„	3·02
„	„	γ Apodis, S.P.……	4·11·18·78			18·78	+4·55	4·68	„	4·13
8	„	γ Apodis…………	16·11·23·33			23·33	−0·19	4·36	„	3·84
„	„	γ Apodis, S.P.……	4·11·23·43	West 0·05	+0·09	23·52				
9	West	γ Apodis, S.P.……	4·11·26·48	East 0·24	−0·45	26·03	+1·14[a]		0·567	2·01
10	„	γ Apodis…………	16·11·29·11	West 0·25	−0·37	28·74				
11	„	γ Apodis…………	16·11·31·96			31·96	−0·60			
„	„	γ Apodis, S.P.……	4·11·32·09	West 0·25	+0·47	32·56	+5·24	4·64	1·134	4·09
12	East	γ Apodis…………	16·11·37·80			37·80				
13	„	γ Apodis…………	16·11·41·80	West 0·14	−0·21	41·59	+0·90			
„	„	γ Apodis, S.P.……	4·11·40·50	West 0·10	+0·19	40·69	+3·53	+4·43	„	3·90
14	„	γ Apodis…………	16·11·44·59	West 0·25	−0·37	44·22				
									Mean..	+2·288
Sept. 5	East	β Apodis…………	16·22·26·12	West 0·05	−0·06	26·06	+0·43			
„	West	β Apodis, S.P.……	4·22·25·80	East 0·10	−0·17	25·63	+2·30	+2·73	1·010	+2·70
6	„	β Apodis…………	16·22·27·93			27·93	−1·78	0·52	„	0·51
„	„	β Apodis, S.P.……	4·22·29·46	West 0·15	+0·25	29·71	+2·97	1·19	„	1·18
7	East	β Apodis…………	16·22·32·29	East 0·30	+0·39	32·68	0·00	2·97	„	2·94
„	„	β Apodis, S.P.……	4·22·32·68			32·68	+4·34	4·34	„	4·30
8	„	β Apodis…………	16·22·37·02			37·02	−0·15	4·19	„	4·15
„	„	β Apodis, S.P.……	4·22·37·09	West 0·05	+0·08	37·17				
9	West	β Apodis, S.P.……	4·22·40·89	East 0·24	−0·40	40·49	+2·54			
10	„	β Apodis…………	16·22·43·35	West 0·25	−0·32	43·03	+0·86	3·40	„	3·37
„	„	β Apodis, S.P.……	4·22·42·17			42·17	+3·55	4·41	„	4·37
11	„	β Apodis…………	16·22·45·72			45·72	−1·05	2·50	„	2·48
„	„	β Apodis, S.P.……	4·22·46·35	West 0·25	+0·42	46·77				
13	East	β Apodis…………	16·22·56·07	West 0·14	−0·18	55·89	+1·08			
13	„	β Apodis, S.P.……	4·22·54·64	„ 0·10	+0·17	54·81	+3·58	4·66	„	4·61
14	„	β Apodis…………	16·22·58·71	„ 0·25	−0·32	58·39	+0·10	+3·68	„	3·64
„	„	β Apodis, S.P.……	4·22·58·46	East 0·10	−0·17	58·29				
									Mean..	+3·114
Aug. 30	East	β Argûs, S.P.……	21·12·31·11			31·11	+2·29			
„	„	β Argûs…………	9·12·33·40			33·40	−1·57	+0·72	0·6016	+1·20
31	West	β Argûs, S.P.……	21·12·34·97			34·97	+2·07	+0·50	„	+0·83
„	„	β Argûs…………	9·12·37·04			37·04				
Sept. 4	East	β Argûs…………	9·12·50·68	East 0·10	+0·07	50·75	−1·52			
5	West	β Argûs, S.P.……	21·12·52·38	East 0·10	−0·11	52·27	+1·98	+0·46	„	+0·76
„	„	β Argûs…………	9·12·54·15	East 0·15	+0·10	54·25	−1·29	+0·69	„	+1·15
6	„	β Argûs, S.P.……	21·12·55·54			55·54	+1·31	+0·02	„	+0·03
„	„	β Argûs…………	9·12·56·78	East 0·10	+0·07	56·85	−2·90	−1·59	„	−2·64
7	East	β Argûs, S.P.……	21·12·59·75			59·75	+2·00	−0·90	„	−1·50
„	„	β Argûs…………	9·12·61·69	East 0·08	+0·06	61·75	−1·65	+0·35	„	+0·58
8	„	β Argûs, S.P.……	21·12·63·35	West 0·05	+0·05	63·40				

(a) $-1^s{\cdot}62$ applied for rate, and $+0^s{\cdot}05$ for motion in R.A.

§ 10.

Determination of the Azimuth of the Meridian Disc at Kamies-Sector Berg—*continued.*

Date 1843.	Illuminated Pivot West or East.	Star.	Observed transit corrected for collimation and level, and reduced to middle wire.	Middle wire east or west of center of disc in terms of diameter of disc.	Correction to transit.	Seconds of transit corrected	Upper transit minus lower transit.	Sum.	Divisor.	Error in Azimuth of disc.
			h m s		s	s	s	s		″
Sept. 9	West	β Argûs, S.P.......	21·13· 7·23			7·23	+0·47			
„	„	β Argûs..	9·13· 7 67	East 0·05	+0·03	7·70	−2·44	−1·97	0·6016	−3·27
10	„	β Argûs, S.P.......	21·13·10·14			10·14	+1·31	−1·13	„	−1·88
„	„	β Argûs.....	9·13·11·45			11·45	−2·41	−1·10	„	−1 83
11	„	β Argûs, S.P.	21·13·13·86			13·86	+1·98	−0·43	„	−0·71
„	„	β Argûs............	9·13·15·92	West 0·12	−0·08	15·84	−1·99	−0·01	„	−0·02
12	East	β Argûs, S.P.......	21·13·17·83			17·83	+2·86	+0·87	„	+1·45
„	„	β Argûs............	9·13·20·69			20·69	−0·66	+2·20	„	+3·66
13	„	β Argûs, S.P.......	21·13·21·35			21·35	+3·32	+2·66	„	+4·42
„	„	β Argûs............	9·13·24·67			24·67	−1·12	+2·20	„	+3·66
14	„	β Argûs, S.P.......	21·13·25·79			25·79	+2·04	+0·92	„	+1·53
„	„	β Argûs............	9·13·27·76	East 0·10	+0·07	27·83	−0·80	+1·24	„	+2·06
15	West	β Argûs, S.P.......	21·13·28·63			28·63				
									Mean..	+0·499

Collecting the results given by the several stars, we have for the deviation of the disc to the west of the south point:

	″	No. of results.
By α Trianguli............	2·470............	19
β Trianguli............	4·334............	8
γ Apodis...............	2·288............	13
β Apodis...............	3·114............	11
β Argus................	0·499............	19

The mean of the whole is 2·″22, and reckoning from the south point round by the west, the azimuth of the disc is 0°·0′·2″·22.

Comparison of the Astronomical and Geodetical Azimuths of Louis Fontein.

	° ′ ″
Angle, Meridian Disc—Azimuth Point—Louis Fontein (p. 470)........................	10·34·44·96
Azimuth of the Meridian Disc	0· 0· 2·22
Azimuth of Louis Fontein at "Azimuth Point"....................................	10·34·47·18
Angle, West Rock—Louis Fontein—Azimuth Point (p. 469)...............................	−2·19·44
Convergence of the Meridians of West Rock and Azimuth Point..............	+ 1·09
Astronomical Azimuth of Louis Fontein at West Rock....................................	10·32·28·83
Geodetical Azimuth of Louis Fontein at West Rock (p. 582, No. 78)	10·32·21·46
Difference.........	7·37

§ 10.

Table of the Final Results of the Observed Latitudes, the Calculated Latitudes, and the Distances of the Parallels of the Sector Stations.

STATIONS.	Astronomical Latitudes.	Geodetical Latitudes.	Diff.	Distance of the Parallels.	Length of the Meridian Arc calculated with the geodetical latitudes.	Diff.
	° ′ ″	° ′ ″	″	feet	feet	feet
North End	29·44·17·69	29·44·17·32	−0·37	....	....	
Kamies Sector Berg.	30·21·29·06	30·21·20·70	−8·36	224600·6	224600·7	+0·1
Heerenlogement's Berg	31·58· 9·03	31·58· 9·64	+0·61	811506·8	811506·7	−0·1
Royal Observatory	33·56· 3·20	33·56· 3·20	....	1526385·1	1526385·0	−0·1
Zwart Kop	34·13·32·12	34·13·33·80	+1·68	1632581·4	1632581·5	+0·1
Cape Point	34·21· 6·26	34·21· 6·81	+0·55	1678373·8	1678374·1	+0·3

The astronomical latitudes are derived from the amplitudes observed with Bradley's Zenith Sector (vol. II, page 437), taking the latitude of the Royal Observatory, 33°·56′·3″·20.

The geodetical latitudes are computed with Airy's elements (page 589).

The 5th column gives the distance between the parallels of the Stations calculated by the method of "nodes" (page 571).

In the 6th column are given, for the purpose of comparison, the same distances calculated with the geodetical latitudes, from Bessel's formula, viz.:

$$S = a\,(1-n)^2\,(1+n)\,\left\{m\,\phi - m_1 \sin.\phi \cos.2\lambda + m_2 \sin.2\phi \cos.4\lambda - m_3 \sin.3\phi \cos.6\lambda\right\}$$

where ϕ is the difference of the latitudes; 2λ the sum of the latitudes; $n = \frac{a-b}{a+b}$;

$$m = 1 + \frac{9}{4}n^2;\ m_1 = 3n + \frac{45}{8}n^3;\ m_2 = \frac{15}{8}n^2;\ m_3 = \frac{35}{24}n^3.$$

With Airy's elements, viz.: $a = 20923713$ feet, and $b = 20853810$ feet, we find $n = 0·0016732203$; $m = 1·0000062993$; $m_1 = 0·00501969$; $m_2 = 0·0000052494$; $m_3 = 0·0000000068$; and $\log. a\,(1-n)^2\,(1+n) = 7·31991026$.

Hence we may put:

$$S = A\,\phi'' - B \sin.\phi \cos.2\lambda + C \sin.2\phi \cos.4\lambda - D \sin.3\phi \cos.6\lambda,$$

where $\log. A = 2·00548787$; $\log. B = 5·0205871$; $\log. C = 2·04002$; $\log. D = \bar{1}·1524$.

SECTION XI. § 11.

INVESTIGATION

OF THE

LENGTH OF LA CAILLE'S ARC IN TERMS OF THE MODERN BASE.

§ 11. La Caille's South Station. Reduction to the Center, and determination of the angle between Kapoc Berg and Riebeek's Kasteel.

Reduction of the measured angles to the assumed Stations.

1.—Rogge Bay Guard House Station to La Caille's Observatory Station, 118.8 feet from the corner of the street.

$r = 122$ feet, log. $r'' = 7.4007849$.

Referring to page 438, we find the angular distance between Tyger Berg Pile and Rogge Bay Guard House, as measured at La Caille's Observatory Station, to be 2° 32′ 27″, consequently the angles of direction of Kapoc Berg and Riebeek's Kasteel are 291° 6′ 7″ and 324° 38′ 35″. Subtracting 180° 2′ 8″ and 180° 1′ 0″ respectively from these values, we obtain the angles of direction (γ) of the same points at the Rogge Bay Station, and reckoned from La Caille's Observatory towards the right.

STATIONS.	γ.	Log. r'' sine γ.	Log. Distances.	Log. Reduction.	Reduction.
	° ′ ″				″
La Caille's Observatory	0· 0· 0				
Kapoc Berg, Signal Rock	111· 3·59	7·3707431	5·2629184 (a)	2·1078247	128·18
Kapoc Berg, Cylindrical Rock	111· 4·47	7·3707042	5·2626269	2·1080773	128·26
Riebeek's Kasteel, Angle Point	144·37·35	7·1633927	5·3859404 (b)	1·7774523	59·90
Riebeek's Kasteel, La Caille's Pile	144·37·49	7·1633542	5·3859465	1·7774077	59·90

(a) Log. (183153 + 44) feet. (b) Log. (243087 + 100) feet.

At the Rogge Bay Guard House Station, the corrected angle between the Kapoc Berg and Riebeek's Kasteel Stations is, p. 542, △ 42		° ′ ″ 33·33·35·04		
The reduction, Rogge Bay to La Caille's Observatory	−	1· 8·28		
„ „ Kapoc Berg Signal Rock to Cylindrical Rock, p. 450	−	47·50		
„ „ Riebeek's Kasteel Angle Point to La Caille's Pile, p. 452	+	14·24		
Hence, the Angle at La Caille's Observatory between La Caille's Rock, Kapoc Berg, and La Caille's Pile, Riebeek's Kasteel	=	33·31·53·50	weight	41

The same angle is derived from the measures on the roof of the building over the supposed site of La Caille's Observatory, as follows:

Angle between Kapoc Berg and Riebeek's Kasteel, p. 438		° ′ ″ 33·32·31·87		
The reduction, Kapoc Berg Signal Rock to Cylindrical Rock, p. 450 ...	−	47·57		
„ „ Riebeek's Kasteel Angle Point to La Caille's Pile, p. 452	+	14·23		
		33·31·58·53	weight	16·7
The Mean	=	33·31·54·96	weight	57·7

§ 11. Kapoc Berg Station. Reduction of measured angles to La Caille's Rock.

Reduction of the measured angles to the assumed Stations—*continued.*

2. Kapoc Berg Station.

		° ′ ″	
Angle, reduced to La Caille's Rock, between Riebeek's Kasteel and La Caille's Observatory, p. 450		98·19·21·81	
The reduction of Riebeek's Kasteel Angle Point to La Caille's Pile, p. 452	−	9·65	
		98·19·12·16	weight 22·84

Angle reduced to La Caille's Rock, between Riebeek's Kasteel and Rogge Bay, p. 450		98·17·17·12	
The reduction, Rogge Bay to La Caille's Observatory	+	2· 8·26	
„ „ Riebeek's Kasteel Angle Point to La Caille's Pile, p. 452	−	9·65	
		98·19·15·73	weight 10·5

Angle measured at Signal Rock between Riebeek's Kasteel and Rogge Bay, △ 42 p. 542		98·13·18·70	
The reduction, Signal Rock to La Caille's Rock, p. 450	+	3·57·98	
„ „ Rogge Bay to La Caille's Observatory	+	2· 8·18	
„ „ Riebeek's Kasteel Angle Point to La Caille's Pile, p. 452	−	9·63	
		98·19·15·23	weight 21·5

Angle measured at Signal Rock between Riebeek's Kasteel and La Caille's Observatory, p. 476 and △ 44 p. 542		98·15·20·99	
The reduction, Signal Rock to La Caille's Rock, p. 450	+	3·58·05	
„ „ Riebeek's Kasteel Angle Point to La Caille's Pile, p. 452	−	9·63	
		98·19· 9·41	weight 4
The mean of these four results gives for the Angle at La Caille's Rock between La Caille's Pile, Riebeek's Kasteel, and La Caille's Observatory		98·19·13·73	weight 58·8

Angle measured at Signal Rock between West End of Base and East End of Base △ 1 p. 534		33·37·47·34	
Reduction, Signal Rock to La Caille's Rock, p. 450	−	2·16·95	
Angle, West End of Base—La Caille's Rock, Kapoc Berg – East End of Base	=	33·35·30·39	weight 58

Angle measured at Signal Rock between East end of Base and Riebeek's Kasteel △ 2 p. 534		52·39·14·77	
Reduction, Signal Rock to La Caille's Rock, p. 450	+	1· 9·22	
„ Riebeek's Kasteel Angle Point to La Caille's Pile, p. 452 ...	+	9·63	
Angle, East end of Base—La Caille's Rock, Kapoc Berg—La Caille's Pile, Riebeek's Kasteel	=	52·40·33·62	weight 49

Angle measured at Signal Rock between Klip Fontein Granary and Riebeek's Kasteel, p. 476		73·53·13·19	
Reduction, Signal Rock to La Caille's Rock, p. 450	−	2·24·85	
„ Riebeek's Kasteel Angle Point to La Caille's Pile, p. 452 ...	+	9·63	
„ Klip Fontein Granary to Signal Fire, p. 455	+	2·59·40	
Angle, Klip Fontein Signal Fire—La Caille's Rock, Kapoc Berg—La Caille's Pile, Riebeek's Kasteel	=	73·53·57·37	weight 35

§ 11. Riebeek's Kasteel Station. Reduction to La Caille's Pile.

Reduction of the measured angles to the assumed Stations—*concluded.*

3. Riebeek's Kasteel Station.

		° ′ ″		
Angle between Rogge Bay and Kapoc Berg Signal Rock, △ 42, p. 542		48·13·12·08		
Reduction, Angle Point to La Caille's Pile, p. 452	−	4·62		
„ Signal Rock Kapoc Berg to La Caille's Rock, p. 450	−	3·10·48		
„ Rogge Bay to La Caille's Observatory	−	59·90		
Angle, La Caille's Observatory—La Caille's Pile—La Caille's Rock, Kapoc Berg ...	=	48· 8·57·08	weight	46

Angle between Kapoc Berg and East end of Base, △ 2 p. 534		33·50·58·67		
Reduction, Angle Point to La Caille's Pile, p. 452	−	17·49		
„ Signal Rock, Kapoc Berg, to La Caille's Rock, p. 450 ...	+	3·10·48		
Angle, La Caille's Rock, Kapoc Berg—La Caille's Pile—East end of Base	=	33·53·51·66	weight	79

Angle between Kapoc Berg and the Granary Klip Fontein, p. 477		76· 5·39·47		
Reduction, Angle Point to La Caille's Pile, p. 452	−	21·36		
„ Signal Rock, Kapoc Berg, to La Caille's Rock, p. 450 ...	+	3·10·48		
„ Granary to Signal Fire, Klip Fontein, p. 455	−	2·45·46		
Angle, La Caille's Rock, Kapoc Berg—La Caille's Pile—Signal Fire, Klip Fontein ...	=	76· 5·43·13	weight	32·5

4. East End of Base.

		° ′ ″		
Angle between Kapoc Berg and West end of Base, △ 1. p. 534		44·53·24·78		
Reduction, Signal Rock, Kapoc Berg, to La Caille's Rock, p. 450 ...	+	4·19·70		
Angle, La Caille's Rock, Kapoc Berg—East End of Base—West End of Base	=	44·57·44·48	weight	40

Angle between Riebeek's Kasteel and Kapoc Berg, △ 2. p. 534		93·29·48·49		
Reduction, Signal Rock, Kapoc Berg, to La Caille's Rock, p. 450 ...	−	4·19·70		
„ Riebeek's Kasteel Angle Point to La Caille's Pile, p. 452 ...	+	7·86		
Angle, La Caille's Pile, Riebeek's Kasteel—East end of Base—La Caille's Rock, Kapoc Berg	=	93·25·36·65	weight	39

5. West End of Base.

Angle between East end and Kapoc Berg, △ 1. p. 534		101·28·48·42		
Reduction, Signal Rock, Kapoc Berg, to La Caille's Rock, p. 450 ...	−	2· 2·75		
Angle, East end of Base—West end of Base—La Caille's Rock, Kapoc Berg	=	101·26·45·67	weight	42

§ 11. Calculation of the Modern Triangulation of La Caille's Arc in terms of the Modern Base.

STATIONS.	ANGLES.	Weight.	Prop. of Error.	$\frac{\varepsilon}{3}$	Seconds of reduced Angles.	Log. Sines.	Log. Distances.	Distances in feet.	La Caille's Distances.	Excess of La Caille.
△ 1.—Measured Base = 42819·065 Feet. Log. 4·6316371.										
	° ′ ″		″	″	″					feet
La Caille's Rock, Kapoc Berg	33·35·30·39	58	0·00	−0·18	30·2	9·7429380				
East End of Base	44·57·44·48	40	0·00	−0·18	44·3	9·8491991	4·7378982	54688·8		
West End of Base	101·26·45·67	42	0·00	−0·18	45·5	9·9912758	4·8799749	75853·4		
Sum	180· 0· 0·54									
180°+ε	180· 0· 0·54									
Error	0·00									
△ 2.—La Caille's Rock, Kapoc Berg, to East End of Base = 75853·4 Feet. Log. 4·8799749. (From △ 1.)										
La Caille's Pile, Riebeek's Kasteel	33·53·51·66	79	0·00	−0·64	51·0	9·7464076				
East end of Base	93·25·36·65	39	0·00	−0·65	36·0	9·9992228	5·1327901	135765·7	135810·3	+ 44·6
La Caille's Rock, Kapoc Berg	52·40·33·62	49	0·00	−0·64	33·0	9·9004861	5·0340534	108156·7		
Sum	180· 0· 1·93									
180°+ε	180· 0· 1·93									
Error	0·00									
△ 3.—La Caille's Pile, Riebeek's Kasteel, to La Caille's Rock, Kapoc Berg = 135765·7 Feet. Log. 5·1327901. (From △ 2.)										
La Caille's Observatory	33·31·54·96	57·7	+0·01	−1·94	53·0	9·7422487				
La Caille's Rock, Kapoc Berg	98·19·13·73	58·8	+0·01	−1·93	11·8	9·9954051	5·3859465	243190·4	243283·6	+ 93·2
La Caille's Pile, Riebeek's Kasteel	48· 8·57·08	46	+0·02	−1·94	55·2	9·8720855	5·2626269	183074·1	183148·8	+ 74·7
Sum	180· 0· 5·77									
180°+ε	180· 0· 5·81									
Error	−0·04									
△ 4.—La Caille's Pile, Riebeek's Kasteel, to La Caille's Rock, Kapoc Berg = 135765·7 Feet. Log. 5·1327901. (From △ 2.)										
Signal Fire, Klip Fontein	30· 0·28·34	36	−0·23	−2·71	25·4	9·6990626				
La Caille's Rock, Kapoc Berg	73·53·57·37	35	−0·24	−2·71	54·4	9·9826201	5·4163476	260824·0	261000·4	+176·4
La Caille's Pile, Riebeek's Kasteel	76· 5·43·13	32·5	−0·25	−2·70	40·2	9·9870821	5·4208096	263517·6	263654·8	+137·2
Sum	180· 0· 8·84									
180°+ε	180· 0· 8·12									
Error	+0·72									

§ 11. Comparison of the Ancient and Modern Angles.

Of the four Stations which define La Caille's two large triangles, the centers of Riebeek's Kasteel and Kapoc Berg (which are common to both triangles) are known to the requisite degree of accuracy, and the Southern or Cape Town Station may be regarded as known within the range of two feet.

The sum of the angles of this triangle by La Caille's measure was less than 180° + the spherical excess by 24″·8, or exclusive of the excess by 19″, which 19″ he distributed in proportion to the magnitude of the angles.

The sum of the angles of his north triangle was less than 180° + the spherical excess by 16″·2 or excluding the excess by 8″, which he distributed in like manner.

The following comparison shows the differences between the Modern and La Caille's determination of the angles, the former corrected for calculation to the nearest tenth of a second, the latter corrected by himself:—

	MODERN.	LA CAILLE.	DIFFERENCE.
	° ′ ″	° ′ ″	″
Cape Town.......	33·31·53·0	33·31·45·0	+ 8·0
Kapoc Berg......	98·19·11·8	98·19·14·0	− 2·2
Riebeek's Kasteel..	48· 8·55·2	48· 9· 1·0	− 5·8
Klip Fontein.....	30· 0·25·4	29·59·56·0	+ 29·4
Kapoc Berg......	73·53·54·4	73·55· 7·0	− 72 6
Riebeek's Kasteel..	76· 5·40·2	76· 4·57·0	+ 43·2

The differences on the south triangle are less than the recorded errors above mentioned.

True site of La Caille's Granary.

The differences on the north triangle prove that the true site of the Granary at Klip Fontein was northward and westward of the assumed site, and very close to, but more likely within the dwelling-house numbered 2 on the plan of the Klip Fontein locality. (See plate II of part I). Jasper Thiark's house.

Partition walls divide this building into three apartments,—viz.: kitchen, bedchamber, and stable, in sequence order from the north end.

Calculation of the sides of La Caille's triangles as given above, in terms of the Modern Base, and comparison of their lengths with the lengths recorded by him. (The French toise = 6·3945925 English feet).

Calculation of La Caille's Triangles in terms of Modern Base.

Kapoc Berg to Riebeek's Kasteel = 135765·7 Feet. Log. 5·1327901.

	Angles.	Log. Sines.	Log Distances.	Distances.	La Caille's Distances.	La Caille in Excess.
	° ′ ″			feet	feet	feet
Cape Town................................	33·31·45·0	9·7422233	5·1327901	135765·7	135810·3	+ 44·6
Kapoc Berg................................	98·19·14·0	9·9954044	5·3859712	243204·3	243283·6	+ 79·3
Riebeek's Kasteel.........................	48· 9· 1·0	9·8720964	5·2626632	183089·4	183148·8	+ 59·4
Klip Fontein..............................	29·59·56·0	9·6989554	5·1327901	135765·7	135810·3	+ 44·6
Kapoc Berg	73·55· 7·0	9·9826643	5·4164990	260915·0	261000·4	+ 85·4
Riebeek's Kasteel.........................	76· 4·57·0	9·9870596	5·4208943	263568·9	263654·8	+ 85·9

§ 11. Calculation of the Meridional length of La Caille's Arc in terms of the Modern Base, employing his Triangles.

Calculation of the Meridional Distance between La Caille's Observatory in Cape Town and the Signal Fire at Klip Fontein, making use of his Angles and the lengths of the sides as derived from the Modern Base.

According to La Caille, the Azimuth of his Station at Kapoc Berg, as observed at his Observatory and measured from the North towards the West, is ... ... 2°26′24″
The Spherical Angle between Kapoc Berg and Riebeek's Kasteel is ... ... 33°31′46·9″

∴ The Azimuth of Riebeek's Kasteel—reckoning from North towards the East is ... 31° 5′22·9″

STATION AND NODE.	ANGLES.	$\frac{\epsilon}{3}$	Seconds of reduced Angles.	Log. Sines.	Log. Distances.	Distances in feet.
No. 1.—La Caille's Observatory to Riebeek's Kasteel = 243204·3 Feet. Log. 5·3859712.						
n	24°40′48″·8	4″·8	44″·0	9·6206901		
La Caille's Observatory	31° 5′22·9	4·8	18·1	9·7129521	5·4782332	300769·1
Riebeek's Kasteel	124·13·62·6	4·7	57·9	9·9173790	5·6826601	481570·8
180+ε.	180° 0′14·3					
No. 2.—Klip Fontein Signal Fire to Node, (300769·1 − 260915·0) = 39854·1 Feet. Log. 4·6004730.						
p	90° 0′ 0	0·0	0·0	0·0000000		
n	24·40·48·8	0·0	48·8	9·6207121	4·2211851	16641·2
Klip Fontein Signal Fire	65·19·11·3	0·1	11·2	9·9583978	4·5588708	36213·5
180+ε.	180° 0′ 0·1					

		feet
Hence the Meridional Distance of La Caille's Observatory to Node		481570·8
„ „ „ Node to Perpendicular (p)	−	36213·5
Meridional distance; La Caille's Observatory to Perpendicular from Signal Fire ...		445357·3
Reduction to parallel	+	4·2
Meridional Distance, La Caille's Observatory to parallel of Signal Fire		445361·5
„ „ According to La Caille		445505·5
Excess of La Caille's Measurement		144·0

Meridional length of La Caille's Arc in terms of his own Base is longer by 144 feet than in terms of the Modern Base.

Calculation of the Reduction to parallel at Klip Fontein.

	Logs.
y^2	8·44237
tan. lat.	9·80750
2 Normal (ar. co.)	2·37791
Reduction = 4·24 feet	0·62778

§ 11. Calculation of the Meridional distance between the *supposed* termini of La Caille's Arc.

Calculation of the Meridional Distance between the supposed Positions of La Caille's Observatory and his Signal Fire at Klip Fontein.

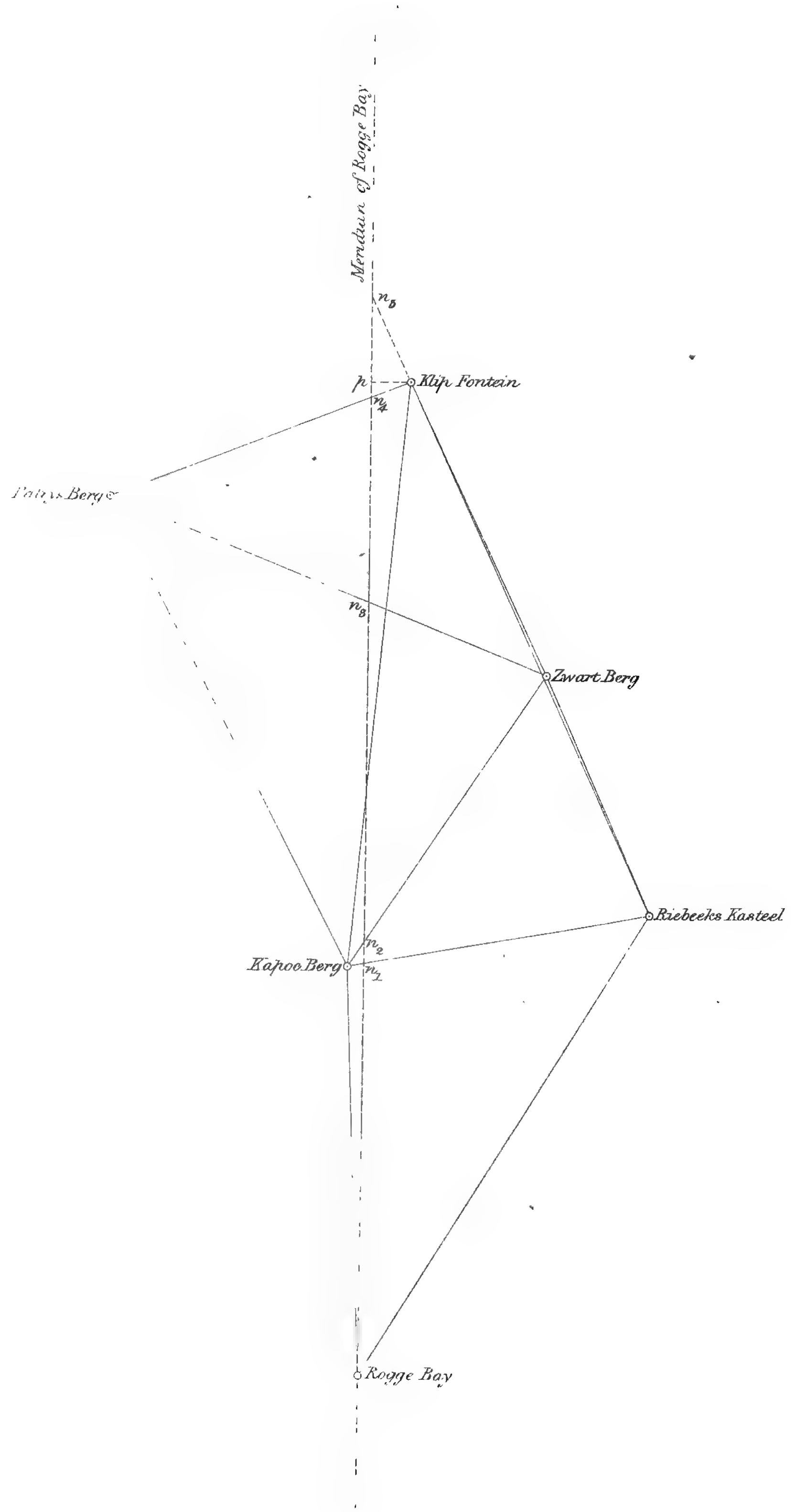
The Azimuth of Riebeek's Kasteel at Rogge Bay, reckoned from the North towards the East, is (p. 578 No 36)		° ′ ″ 31·4· 4·62
Reduction, Rogge Bay to La Caille's Observatory (p. 612)	+	59·90
„ Riebeek's Kasteel Angle Point to La Caille's Pile (p. 452) ...	+	14·23
Hence, Azimuth of La Caille's Pile, Riebeek's Kasteel, on the horizon of La Caille's Observatory	=	31·5·18·75

STATIONS AND NODE.	ANGLES.	$\frac{\epsilon}{3}$	Seconds of reduced Angles.	Log. Sines.	Log Distances.	Distances in feet.
La Caille's Observatory to Riebeek's Kasteel = 243190·4 Feet. Log. 5·3859465.						
	° ′ ″	″	″			
Node	24·40·15·32	−4·76	10·6	9·6205369		
La Caille's Observatory	31· 5·18·75	−4·76	14·0	9·7129378	5·4783474	300848·2
Riebeek's Kasteel	124·14·40·21	−4·76	35·4	9·9173253	5·6827349	481653·7
180°+ε.	180· 0·14·28					
Klip Fontein Signal Fire to Node = (300848·2 − 260824·0) = 40024·2 Feet. Log. 4·6023227.						
p	90· 0· 0·00	−0·05	59·9	0·0000000		
n	24·40·15·32	−0·05	15·3	9·6205586	4·2228813	16706·3
Klip Fontein Signal Fire	65·19·44·83	−0·05	44·8	9·9584303	4·5607530	36370·8
180°+ε	180· 0· 0·15					

		feet
From the above we have, Meridional Distance of La Caille's Observatory to Node ...	=	481653·7
„ Node to Perpendicular	−	36370·8
		445282·9
Reduction to the parallel	+	4·3
Meridional Distance of supposed positions of La Caille's Observatory and his Signal Fire at Klip Fontein		445287·2

Calculation of the Reduction to parallel at Klip Fontein.

	Logs.
y^2	8·44576
tan. lat.	9·80750
2 Normal (ar. co.)	2·37791
Reduction 4·28 feet	0·63117


Meridian of Rogge Bay
n_5
p
Klip Fontein
n_4
Kaays Berg
n_3
Zwart Berg
Riebeeks Kasteel
n_2
Kapoo Berg
n_1
Rogge Bay

§ 11. Calculation of the Meridional distance between the Stations of Bradley's Sector at Rogge Bay Guard House and Klip Fontein.

Calculation of the Meridional Distance between the Rogge Bay Station and the Klip Fontein Sector Station.

In order to obtain the distance of the Klip Fontein Sector Station from Riebeek's Kasteel, Patrys Berg, Zwart Berg, and Kapoc Berg, it will be necessary to reduce to the Sector Point the Angle measured at the Granary (page 456) between Riebeek's Kasteel and Kapoc Berg.

By a preliminary calculation, the Azimuth of Patrys Berg at the Sector Point was found to be 68°·36′·25″·5, and of Kapoc Berg 5°·24′·27″·1. Hence the Angle between Kapoc Berg and Patrys Berg is 63°11′58″4. The Angle of Direction (γ) for Patrys Berg is 283°·21′·13″·2 (page 455); consequently the values of γ for Riebeek's Kasteel and Kapoc Berg are 190°·6′·20″·1 and 220°·9′·14″·8. Subtracting 180°·0′·37″ and 180°·2′·16″ respectively from these numbers, we obtain the Angles of Direction at the Granary Station,—reckoned from the Sector Point toward the right. Hence the reduction for Riebeek's Kasteel = 0′·37″·36 and for Kapoc Berg = 2′·15″·87.

Therefore the reduction to the Sector Point is	+	0° 1′ 38″·51	
Angle at Granary between Riebeek's Kasteel and Kapoc Berg (p. 456)	=	30· 1·16·19	
Angle, reduced to Sector Point, between Riebeek's Kasteel and Kapoc Berg	=	30· 2·54·70	weight 36
The Angle at the Granary between Zwart Berg and Patrys Berg (p. 456)	=	93·48·13·37	
Reduction	+	5·15·51	
Angle, reduced to Sector Point, between Zwart Berg and Patrys Berg	=	93·53·28·88	weight 67
At Patrys Berg the angle between the Granary and Zwart Berg (p. 459) is		43·17·49·66	
Reduction to Sector Point (p. 455)	−	6·19·08	
Angle at Patrys Berg, between Klip Fontein Sector Station and Zwart Berg	=	43·11·30·58	weight 22

The Angles observed at Zwart Berg, Kapoc Berg, and Riebeek's Kasteel will be found at pages 454, 476, and 477, respectively.

Calculation of the Distances.

Stations.	Angles.	Weight.	Prop. of Error.	$\frac{\varepsilon}{3}$	Seconds of reduced Angles.	Log. Sines.	Log. Distances.	Distances in feet.
Kapoc Berg to Riebeek's Kasteel = 135773·25 Feet. Log. 5·1328142. (From △ 2, page 534).								
Klip Fontein Sector Station	30° 2′ 54″·70	36	−0″·60	−2″·70	51″·40	9·6995945		
Kapoc Berg	73·50·56·78	59	−0·37	−2·70	53·71	9·9825101	5·4157298	260453·25
Riebeek's Kasteel	76· 6·18·13	41	−0·53	−2·71	14·89	9·9871001	5·4203198	263220·55
Sum	180· 0· 9·61							
180°+ε	180· 0· 8·11							
Error	+1·50							
Patrys Berg to Zwart Berg = 208827·66 Feet. Log 5·3197880. (From △s 10 and 11, pp. 535, 536.)								
Klip Fontein Sector Station	93·53·28·88	67	+0·20	−1·61	27·47	9·9989978		
Zwart Berg	42·55· 4·19	37	+0·36	−1·60	2·95	9·8331117	5·1539019	142528·56
Patrys Berg	43·11·30·58	22	+0·60	−1·60	29·58	9·8353351	5·1561253	143260·13
Sum	180· 0· 3·65							
180°+ε	180· 0· 4·81							
Error	−1·16							

§ 11. Calculation of the Meridional distance between Bradley's Sector Stations at Rogge Bay and Klip Fontein by Riebeek's Kasteel Angle.

Calculation of the Meridional Distance.

I. By Riebeek's Kasteel.

The Azimuth of Riebeek's Kasteel at Rogge Bay, measured from the South Point round by the West is 211°·4′·4″·62 (see page 578, No. 36.)

STATION AND NODE.	ANGLES.	$\frac{\varepsilon}{3}$	Seconds of reduced Angles.	Log. Sines.	Log. Distances.	Distances in feet.
Rogge Bay to Riebeek's Kasteel = 243086·76 Feet. Log. 5·3857613 (From △ 42, page 542.)						
n_5	° ′ ″ 24·36·39·45	″ −4·76	″ 34·69	9·6195459		
Rogge Bay	31· 3·64·62	−4·76	59·86	9·7126787	5·4788941	301227·15
Riebeek's Kasteel	124·19·30·21	−4·76	25·45	9·9169089	5·6831243	482085·78
180°+ε	180· 0·14·28					
Klip Fontein to n_5 (301227·15 — 260453·25) = 40773·90 Feet. Log. 4·6103822.						
p	89·59·60·00	−0·05	59·95	0·0000000		
n_5	24·36·39·45	−0·05	39·40	9·6195675	4·2299497	16980·47
Klip Fontein	65·23·20·70	−0.05	20·65	9·9586388	4·5690210	37069·86
180°+ε	180· 0· 0·15					

		feet.
From the above we have, distance Rogge Bay to n_5	... ...	482085·78
n_5 to p	... ... —	37069·86
Distance of Rogge Bay to Perpendicular from Klip Fontein Sector Station	... ... =	445015·92

II. By Kapoc Berg, Zwart Berg, and Patrys Berg.

Calculation of the Meridional distance between Bradley's Sector Stations at Rogge Bay and Klip Fontein by the Angles of Kapoc Berg, Zwart Berg, and Patrys Berg.

The Azimuth of Kapoc Berg at Rogge Bay is 177°·30′·29″·58 (see page 577, No. 23.)

STATION AND NODE.	ANGLES.	$\frac{\varepsilon}{3}$	Seconds of reduced Angles.	Log. Sines.	Log. Distances.	Distances in feet.
Rogge Bay to Kapoc Berg = 183152·70 Feet. Log. 5·2628133. (From △ 42, p. 542.)						
n_1	79·17·11·23	−0·12	11·11	9·9923629		
Kapoc Berg	98·13·18·70	−0·11	18·59	9·9955131	5·2659635	184486·04
Rogge Bay	2·29·30·42	−0·12	30·30	8·6382449	3·9086953	8103·92
180°+ε	180· 0· 0·35					
Kapoc Berg to n_1 = 8103·92 Feet. Log. 3·9086953.						
n_2	33· 0·40·77	0·00	40·77	9·7362409		
n_1	100·42·48·77	0·00	48·77	9·9923630	4·1648174	14615·63
Kapoc Berg	46·16·30·46	0·00	30·46	9·8589383	4·0313927	10749.61
180°+ε	180· 0· 0·00					

§ 11.

STATIONS.	ANGLES.	$\frac{\epsilon}{3}$	Seconds of reduced Angles.	Log. Sines.	Log Distances.	Distances in feet.
Zwart Berg to n_2 = (157967·09 — 14615·63) = 143351·46 Feet. Log. 5·1564021 (see △ 7, page 535.)						
n_3	68°10′18″·47	—0·93	17·54	9·9676889		
n_2	33· 0·40·77	—0·93	39·84	9·7362379	4·9249511	84130·04
Zwart Berg	78·49· 3·55	—0·93	2·62	9·9916752	5·1803884	151491·54
180°+ϵ	180· 0· 2·79					
Patrys Berg to n_3 = (208827·66 — 84130·04) = 124697·62 Feet. Log. 5·0958582.						
n_4	68 38·12·86	—0·84	12·02	9·9690845		
n_3	68 10·18·47	—0·83	17·64	9·9676890	5·0944627	124297·59
Patrys Berg	43·11·31·18	—0·84	30·34	9 8353368	4·9621105	91645·36
180°+ϵ	180· 0· 2·51					
Klip Fontein to n_4 (142528·56 — 124297·59) = 18230·97 Feet. Log. 4·2608098.						
p	90· 0· 0·00	0·00	0·00	0·0000000		
n_4	68·38·12 86	0·00	12·86	9·9690853	4·2298951	16978·34
Klip Fontein	21·21·47·14	0·00	47·14	9·5614318	3·8222416	6641·12
180°+ϵ	180· 0· 0·00					

		feet.
From the above we have, Rogge Bay to n_1	... ...	184486·04
n_1 to n_2	... ...	10749·61
n_2 to n_3	... ...	151491·54
n_3 to n_4	... ...	91645·36
n_4 to p	... ...	6641·12
Distance between Rogge Bay and the Perpendicular from Klip Fontein...	... ...	445013·67
By the Series I.	... ...	445015·92
Mean	... ...	445014·80
Reduction to the parallel	... ... +	4·42
Distance between Rogge Bay and the Parallel of Klip Fontein Sector Station ...	...	445019·22

Meridional distance between the Stations of Bradley's Sector at Rogge Bay and Klip Fontein.

Calculation of the Reduction to a parallel at Klip Fontein.

	feet		logs.
y =	16980·47	y^2	8·45984
	16978·34	tan. lat.	9·80750
		2 Normal (ar. co.) ...	2·37791
Mean	16979·40	Reduction, 4·42 feet	0·64525
Lat. =	32° 41′·54″		

§ 11. Calculation of the Meridional distance between the Royal Observatory and Klip Fontein Sector Stations.

Calculation of the Meridional Distance of the Royal Observatory and Klip Fontein Sector Stations.

I. By Riebeek's Kasteel.

The Azimuth of Riebeek's Kasteel at the Royal Observatory, reckoning from North to East, is 27°·5′·52″·49 (see page 560.)

Station and Node.	Angles.	$\frac{\varepsilon}{3}$	Seconds of reduced Angles.	Log. Sines.	Log. Distances.	Distances in feet.
Royal Observatory to Riebeek's Kasteel = 239295·22 Feet. Log. 5·3789340 (From △ 46, page 543.)						
	° ′ ″	″	″			
n	24·38·24·04	−3·86	20·18	9·6200304		
Royal Observatory	27· 5·52·49	−3·87	48·62	9·6584843	5·4173879	261449·58
Riebeek's Kasteel	128·15·55·07	−3·87	51·20	9·8949600	5·6538636	450675·15
180°+ε	180· 0·11·60					
Klip Fontein to n = (261449·58 − 260453·25) = 996·33 Feet. Log. 2·9984032.						
p	90· 0· 0·00	0·00	0·00	0·0000000		
n	24·38·24·04	0·00	24·04	9·6200482	2·6184514	415·39
Klip Fontein, Sector Station	65·21·35·96	0.00	35·96	9·9585377	2·9569409	905·61
180°+ε	180· 0· 0·00					

	feet.
Hence, the Distance Royal Observatory to n ...	450675·15
n to p ... −	905·61
Distance of Royal Observatory to Perpendicular from Klip Fontein Sector Station ...	449769·54

II. By Kapoc Berg, Zwart Berg, and Patrys Berg.

Continuing the Calculations from No. 12 page 562.

Station and Node.	Angles.	$\frac{\varepsilon}{3}$	Seconds of reduced Angles.	Log. Sines.	Log. Distances.	Distances in feet.
Patrys Berg to n_5 (p. 562) = 142484·44 Feet. Log. 5·1537674.						
n	68·36·28·11	−1·09	27·02	9·9689980		
n_5 (p. 562)	68·12· 3·98	−1·09	2·89	9·9677777	5·1525471	142084·64
Patrys Berg	43·11·31·18	−1·09	30·09	9·8353363	5·0201057	104738·34
180°+ε	180· 0· 3·27					
Klip Fontein to n = (142528·56 − 142084·64) = 443·92 Feet. Log. 2·6473047.						
p	90· 0· 0·00	0·00	0·00	0·0000000		
n	68·36·28·11	0·00	28·11	9·9689989	2·6163036	413·34
Klip Fontein, Sector Station	21·23·31·89	0·00	31·89	9·5619952	2·2092999	161·92
180°+ε	180· 0· 0·00					

	feet.
At page (564) we have the Meridional Distance of Royal Observatory to n_5 ... ... =	344866·94
n_5 to n ...	104738·34
n to p ...	161·92
Hence the Meridional Distance of the Royal Observatory to the Perpendicular from Klip Fontein Sector Station ... =	449767·20
By I ...	449769·54
Mean ...	449768·37
Reduction to the Parallel ... =	0·00
Meridional Distance of Royal Observatory to the Parallel of Klip Fontein Sector Station	449768·37

DISCUSSION OF LA CAILLE'S MEASURE.

Owing to the unavoidable tentative steps for discovering La Caille's stations, the "reductions to the centre," from one point to another, may appear complicated, but no fear need be entertained of their correctness.

The calculation of the modern triangulation (page 615) in conjunction with the comparison of the angles with La Caille's recorded angles (page 616) indicate, as before mentioned, that the position of his Sector was close to or within the North end of the house No. 2 on the plan of Klip Fontein. A slight error in the direction of the meridian line drawn upon the plan would affect the determination of the exact spot.

Applying the modern Base to La Caille's recorded triangles (page 616) and calculating the meridional length of the arc (page 617), we find the distance between Kapoc Berg and Riebeek's Kasteel 44·6 feet, and the meridional length 144 feet shorter than La Caille's recorded determination.

44·6 feet would place his Riebeek's Kasteel pile in the air over a perpendicular precipice of several hundred feet in depth.

The measured length of his base was 6467 toises, 4 feet and $7\frac{1}{2}$ inches, from which he deducted 3 feet 1 inch for the inequalities of the ground, leaving $6467\frac{1}{2}$ toises (equivalent to 41355·44 English feet), the length he employed in calculating his triangles.

$$\frac{41355{\cdot}44 \times 44{\cdot}6}{135765{\cdot}7} = 13\overset{\text{feet}}{\cdot}586$$

$=$ 2·1245 toises, by which his Base appears in excess.

He measured with four rods, each three toises in length, placed on the ground, end to end, therefore each set consisted of 12 toises, and he states as follows:—

"Je prenois moi seul le soin de faire aboutir exactement toutes les perches les unes aux autres. "A chaque portée, qui étoit de 12 toises, je me faisois donner un jeton par celui qui etoit à la tête des "perches. Je plantois un petit piquet, presque à fleur de terre. Au bout de 10 portees, ou de 120 toises. "Je revenois ensuite, en mesurant une seconde fois et en comptant toûjours mes jetons: je voyois si à "chaque dixième je retombois sur mes petits piquets. Etant arrivé au terme d'ou j'etois parti d'abord, je "marquois la différence entre mes deux mesures, puis je vérifiois la longueur de mes quatre perches."

After measuring the Base, he proceeded to Cape Town, calculated the length of the arc, and finding the degree so considerably longer than he expected, he returned to Zwartland with a cord 30 toises in length, "divisé de 3 en 3 toises," with which he ascertained by means of the pickets left in position, that he had not committed an error in counting the sets.

By this description, it appears that La Caille took every precaution to ensure as much accuracy as the method of measuring a Base in his day admitted of: an error of $\frac{1}{3044}$ part of the whole is large compared with the precision attainable at present.

Page 615 gives the calculation of the Modern Triangulation, effected on the supposition that the foundation originally discovered was the site of the Klip Fontein Granary, and page 618 the calculation of the Meridional Distance referred to the supposed position of the Signal Fire.

Page 617 gives the calculation of the position of the Signal Fire derived from his own triangles and the Modern Base. The former is 445287·2 ft., perpendicular 16706·3 ft. The latter is 445361·5 ft., perpendicular 16641·2 ft.

If, however, in the calculation of the latter we use the same Azimuth that was employed in the former, the latter numbers become 445361·7, perpendicular 16632·4, and the true position of the Signal Fire was 74·5 ft. north and 73·9 ft. west of the assumed position.

We have next to inquire the meridional distance between the stations of Bradley's Sector at Rogge Bay Guard House and Klip Fontein.

A plan of the triangulation is given at page 619, and the calculations at pages 619, 620, and 621.

The meridional distance by the Riebeek's Kasteel angle is 445020·34, and by the angles at Kapoc Berg, Zwart Berg and Patrys Berg 445018·09. The mean 445019·22.

Finally, the calculation of the meridional distance between the stations of Bradley's Sector at the Royal Observatory and Klip Fontein is given at page 622.

By the Riebeeks Kasteel angle	449769·54
By the angles at Kapoc Berg, Zwart Berg, and Patrys Berg..	449767·20
The mean..	—449768·37

La Caille's determination of the value of one degree, (Mem. de l'Acad. p. 435) was 57037 toises, equivalent to 364728·4 English feet: the celestial arc being $1°{\cdot}13'{\cdot}17''{\cdot}\frac{1}{3}$, but he afterwards adopted $1°{\cdot}13'{\cdot}17''{\cdot}5$. (Fund. Ast) Recomputing with the latter, the value of one degree .. .. .. = 364711·8 ft.

The modern base applied to his triangles gives (p. 617) the meridional distance 445361·5, which compared with the celestial arc $1°{\cdot}13'{\cdot}17''{\cdot}5$, one degree = 364593·9 ft.

The meridional distance between the stations of Bradley's Sector at Klip Fontein and Rogge Bay (p 621) is 445019·22 ft. The celestial arc (p. 110) $1°{\cdot}13'{\cdot}14''{\cdot}56$ value of one degree .. .. = 364557·3 ft.

The meridional distance between the stations of Bradley's Sector, at the Royal Observatory and Klip Fontein (p. 622), is 449768 37, and the celestial arc (p. 110) and vol. ii, p. 438,

$$\left.\begin{array}{r}1°{\cdot}13'{\cdot}14''{\cdot}56\\+\ 48{\cdot}34\end{array}\right\} = 1°{\cdot}14'{\cdot}2''{\cdot}90$$

Value of one degree .. .. = 364439·0 ft.

The difference between the two last = 118 feet, is an index to the relative influence of Table Mountain on the Cape Town and Royal Observatory stations, which the following abstract will place in a stronger light.

Abstract of Amplitudes.

ARC.	AMPLITUDE.	REFERENCES.
Rogge Bay to the Royal Observatory................................	° ′ ″ 0· 0·48·34	Vol. II, page 438.
Rogge Bay Klip Fontein..	1·13·14·56	Vol. I, page 110.

And assuming the Latitude of the Royal Observatory to be 33°·56′·3″·20, we have:

Station.	Latitude by Sector Observation.	Latitude calculated from the triangulation with Airy's elements.	Observed minus calculated.	Distance between the parallels calculated by "nodes."	Distance computed from the Geodetic latitudes by Bessel's formula.
				feet	feet
Rogge Bay..	° ′ ″ 33·55·14·86	° ′ ″ 33·55·16·22	″ − 1·36		
Klip Fontein, Sector Station........................	32·42· 0·30	32·41·53·11	+ 7·19	445019·22	445018·82

From the above we find that the principal part of the deflection of the plumbline on La Caille's arc, was at the North end, where mountain masses run N.W. beyond Klip Fontein. The total effect on the arc = about 8″·55, verifies the wisdom of extending the operation.

T. M.